OCTOBER 1951

PRECISION METAL MOLDING

FORMERLY DIE CASTINGS MAGAZINE

DIE CASTINGS
INVESTMENT CASTINGS
POWDER METALLURGY
PERMANENT MOLD CASTINGS
PLASTER MOLD CASTINGS

PMM

DESIGN • MANUFACTURE • FINISHING • USE

ALUMINUM PERMANENT MOLD CASTINGS

also sand-cored and heat-treated

HIGH PRESSURE ALUMINUM DIE CASTINGS

machined, finished, assembled

CERTIFIED ZINC DIE CASTINGS

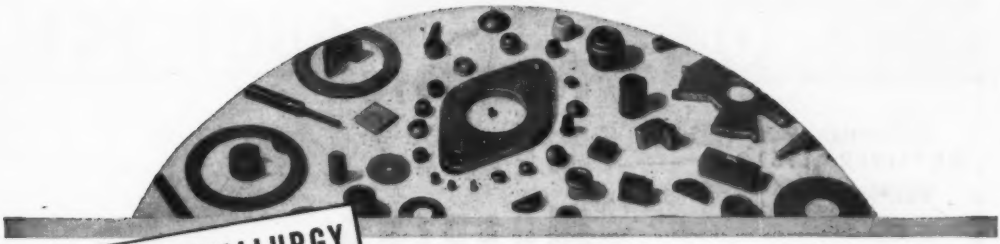
polished, buffed, plated, painted

VELVAGLAZE* PROCESS

for brighter, smoother, more durable permanent mold and die castings

4 STAR SERVICES...

For further information circle No. 52 on the Reader Service Card



POWDER METALLURGY
the modern method of manufacturing

KUX PRESSES

THE MACHINES UNIVERSALLY USED

POWDER METALLURGY is the process being chosen for the manufacture of many products because of the cost savings produced from this automatic, high speed production method. Parts such as porous, self-lubricating bearings, carbon brushes, and insulators, Alnico magnets, carbide tool bits, magnetic radio cores, contact buttons, gears, cams and literally thousands of other items are accurately and automatically made with unbelievable cost savings on Kux Presses.

BUILDERS of the most complete line of machines available for this industry, Kux Presses have been selected by all the leading manufacturers for the superiority in design and construction built into every model. A penny post card will bring you detailed information and an illustrated catalogue.

KUX MACHINE COMPANY
6725 N. RIDGE • CHICAGO 26, ILLINOIS

For further information circle No. 29 on the Reader Service Card

OCTOBER 1951
Vol. 9 No 10

PRECISION METAL MOLDING

DIE CASTINGS • INVESTMENT CASTINGS • POWDER METALLURGY
PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS

CONTENTS

LETTERS TO THE EDITOR 4
LITERATURE AND SERVICES OFFERED IN THIS MONTH'S ADS 8
COSTS FIGURED IN MILS-PER-GROSS: two stampings replaced by powder metallurgy 33
POROSITY PROBLEM REDUCED because less machining is needed by die casting 35
IMPROVED BALANCE OF PARTS as a result of close control of weight by investment casting 36
WIDE RANGE OF NON-FERROUS ALLOYS can be produced by plaster mold casting 38
FIVE PROBLEM PIECES produced by investment casting and die casting 40
SAFETY MANUAL COMMITTEE HONORED by award of American Die Casting Institute 42
PREFERRED LIST OF DIMENSIONS for sintered bearings are set up by M.P.A. 43
WELDABILITY OF MAGNESIUM PERMANENT MOLD CASTINGS makes improved, modern dockboards possible 44
INTERCHANGEABILITY AND LOW COST in these combination lock parts come from die casting and plaster mold casting 48
BEHIND THE SCENES: a presentation of some steps in the production of investment castings 52
RUBBER OR METAL MOLDS useful for making wax investment casting patterns 54
INDUSTRY NEWS 76
SIMPLIFIED SOLUTIONS for production problems 81
OPPORTUNITIES 84
A SPECIAL P.M.M. REPORT
INFILTRATION POWDER METALLURGY: what it offers the designer of high density parts 91

FINISHING SECTION

PRODUCTION CLINIC—Some suggestions for machining powdered metal parts 57
ROAD TESTED CHROME SUBSTITUTE FINISH stands up well after 10,000 miles 60
NEW PRODUCTS 65
USEFUL LITERATURE 72

IRVING B. HEXTER
President

LESTER P. AURBACH
Executive Vice-President

EDWIN M. JOSEPH
Vice-President

JEROME R. PESKIN
Vice-President

STAFF

JEROME R. PESKIN
Vice-President in Charge

DAVID W. VEIT
Editor

ALAN T. CAZIER
PHILIP R. KALISCHER
Associate Editors

H. K. BARTON
European Correspondent

EDWIN M. JOSEPH
Circulation Director

All communications should be addressed to PRECISION METAL MOLDING, 1240 Ontario St., Cleveland 13 Ohio. Phone SUperior 1-9422. AT&T Teletypewriter No. CV-233.

SALES OFFICES

NEW YORK OFFICE—
STEPHEN SHEPARD
60 E. 42nd St.
New York 17, New York
Murray Hill 7-3420

CHICAGO OFFICE—
ROBERT McKENNA
520 N. Michigan Ave.—Room 734
Chicago 11, Illinois
Superior 7-7823 and 7-7824

LOS ANGELES OFFICE—
FRED FRISENFELDT
1250 Wilshire Blvd.—Room 602
Los Angeles 17, California
Tucker 6703

ABC

Published monthly by the TECHNICAL PUBLISHING COMPANY, an affiliate of INDUSTRIAL PUBLISHING COMPANY, publishers of APPLIED HYDRAULICS, FLOW, INDUSTRY & WELDING, OCCUPATIONAL HAZARDS, COMMERCIAL REFRIGERATION AND AIR CONDITIONING. Member, Controlled Circulation Audit, Inc. Not responsible for unsolicited editorial material. Indexed regularly by Engineering Index, Inc.

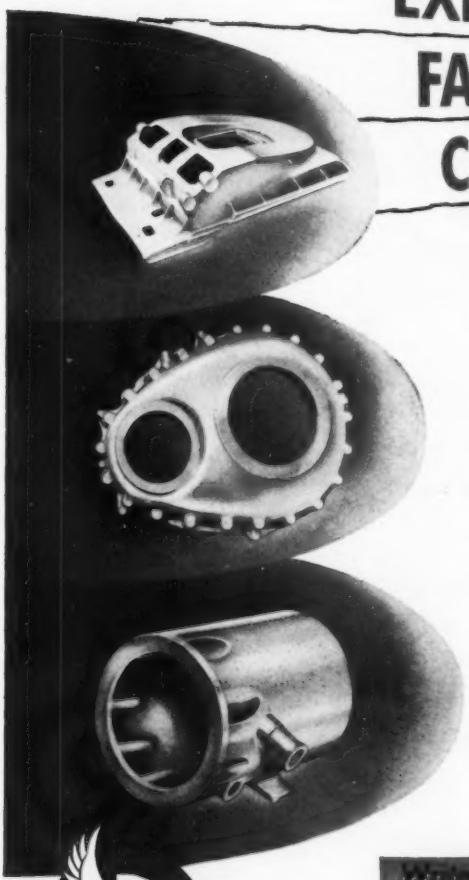
Subscription rates: United States and possessions—$3.00 per year; $5.00 for 2 years; Canada—$4.00 per year, $6.00 for 2 years; Foreign—$5.00 per year. Single copy price 30 cents. All subscriptions subject to individual acceptance by the publisher.

Acceptance under Section 34.64 P. L. & R. authorized.

FOR YOUR DEFENSE JOBS . . .

your Aluminum Castings supplier must have

EXPERIENCE
FACILITIES
CAPACITY



These three essentials to reliable service protect you when you select Aluminum Industries, Inc., as your supplier of aluminum castings.

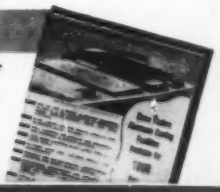
EXPERIENCE — Over 30 years of experience in working with aluminum and its alloys are behind the skill and "know how" of our metallurgists, engineers and foundry personnel.

FACILITIES — In each and every department, from the physical and metallurgical laboratories clear through to the finishing department, the most modern equipment is employed for precision processing, and to control quality at every step of production.

CAPACITY — You'll avoid delivery worries, too. With one of the largest aluminum foundries in the United States for the production of Permanent Mold, Semi-Permanent Mold and Sand Castings (monthly capacity over 2,500,000 lbs. of castings), you can depend upon Aluminum Industries to deliver your aluminum castings when you need them.

Write for Bulletin 20-A

This new Bulletin illustrates and describes our complete facilities for serving your aluminum castings requirements. Recommendations and estimates given without obligation.



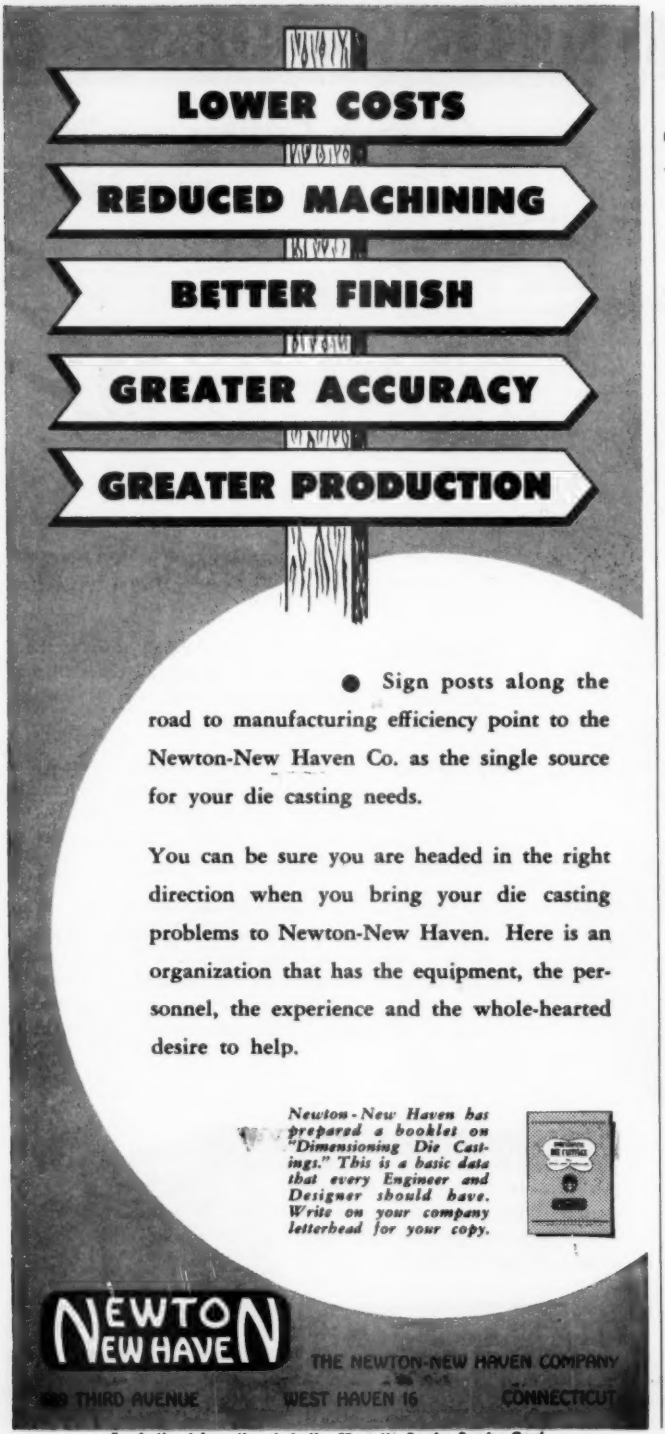
PERMITE

ALUMINUM INDUSTRIES, INC.

CINCINNATI 25, OHIO

ALUMINUM PERMANENT MOLD, SAND and DIE CASTINGS... HARDENED, GROUND and FORGED STEEL PARTS

For further information circle No. 8 on the Reader Service Card.


LOWER COSTS
REDUCED MACHINING
BETTER FINISH
GREATER ACCURACY
GREATER PRODUCTION
● Sign posts along the road to manufacturing efficiency point to the Newton-New Haven Co. as the single source for your die casting needs.
You can be sure you are headed in the right direction when you bring your die casting problems to Newton-New Haven. Here is an organization that has the equipment, the personnel, the experience and the whole-hearted desire to help.
Newton-New Haven has prepared a booklet on "Dimensioning Die Castings." This is a basic data that every Engineer and Designer should have. Writes on your company letterhead for your copy.
NEWTON NEW HAVEN
THE NEWTON-NEW HAVEN COMPANY
THIRD AVENUE
WEST HAVEN 16
CONNECTICUT
For further information circle No. 57 on the Reader Service Card

LETTERS TO THE EDITOR

P.M.M. IMPRESSES

We have received the September issue of PRECISION METAL MOLDING on our library subscription and are very much impressed with the new title and format. Will you please send an additional copy of this issue, addressing it to the writer's attention.—R.M.

Receipt of a large number of letters, telephone calls and personal visits has indicated a highly favorable reaction to this enlarged field of editorial coverage. The introduction of P.M.M., it is hoped, will provide a new source of information and ideas for manufacturers who are considering these high-accuracy metal forming processes.—Ed.

PROTECTIVE FINISH

General Headquarters, Pakistan, have asked us to obtain the article "Protective Finish for an Outboard Motor" published in the April 1947 edition of *Die Castings*. It would be appreciated if one copy of this article could be forwarded to this office.—M.A.S.

Copy forwarded.—Ed.

DIE CAST BRASS

Can brass be die cast? Who do you know who does it? We would appreciate any listing or information on this subject.—M.S.

Brass can be and is die cast. A number of commercial contract die casting plants make a specialty of this, or die cast brass in addition to other alloys.

The problem of die casting brass is principally one of cost due to the short die life when subjected to the repeated thermal shock of this high temperature alloy. However, there are a large number of cases where brass can be economically die cast. A copy of an article on this subject has been forwarded, along with a list of contract die casters engaged in casting brass. —Ed.

DO's and DON'Ts in DESIGNING ZINC and ALUMINUM DIE CASTINGS

examples by DOLLIN

PRINCIPLE: In the case of castings with corrugated sides (such as knurls or gears), save machining and trimming die costs, and improve trimming of castings, by incorporating a bead to permit easier gating and trimming.

EXAMPLE: As shown in Fig. 1, the manufacturer's original design for this aircraft conduit cap called for knurls carried to edge a. Dollin engineers suggested adding .040" bead b around the circumference, as shown in Fig. 2.

Fig. 1

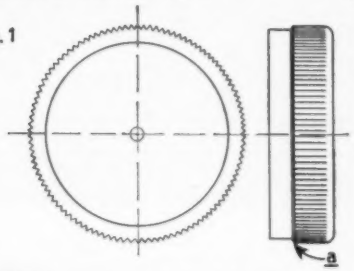
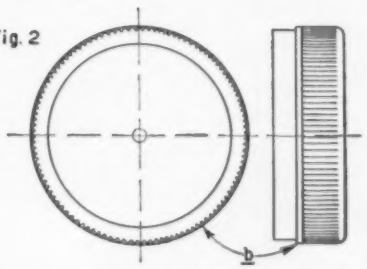
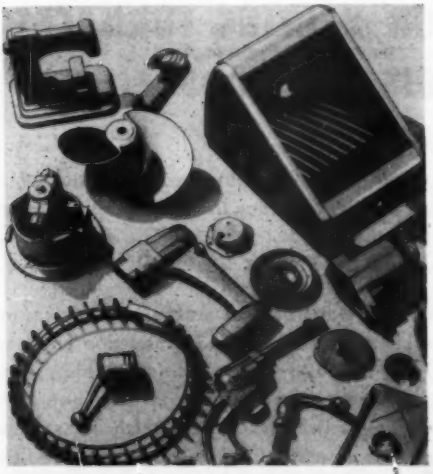


Fig. 2



RESULT: Reduced costs and an improved product for the manufacturer.



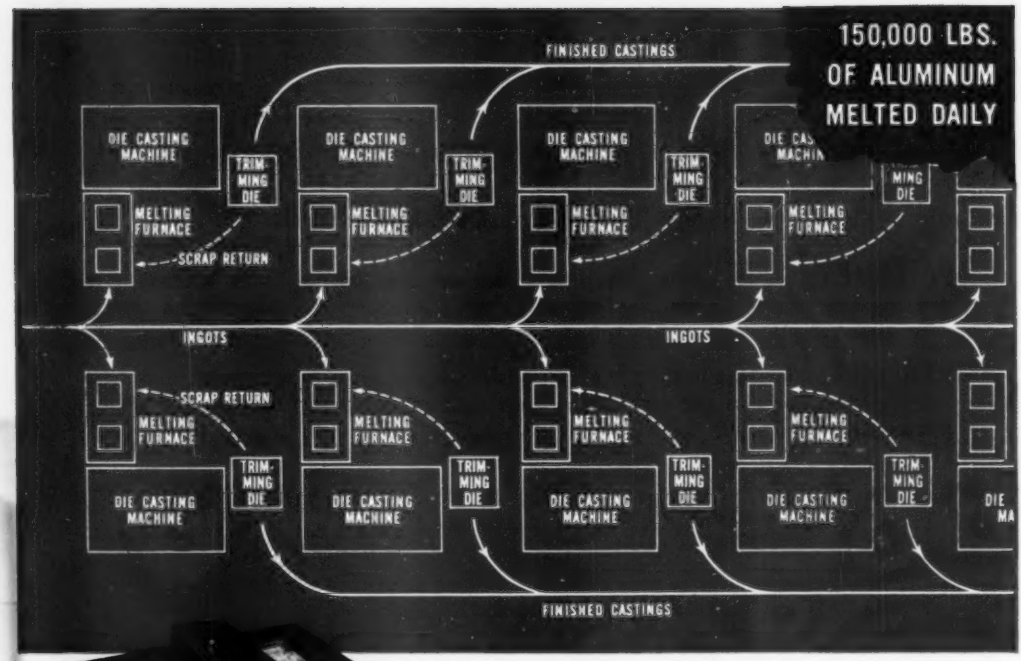
DOLLIN ENGINEERS will work with you on die casting designs, recommending any changes that will reduce overall cost. Our broad, modern facilities—which include a separate small castings department—permit low cost production of die castings through all commercial sizes. We have long been serving many of the country's leading manufacturers. Send prints or samples for estimates and engineering suggestions, at no obligation.

PRIME CONTRACTORS—CHECK WITH DOLLIN FOR SUBCONTRACTING ON DEFENSE ORDERS

DOLLIN CORPORATION
614 So. 21st St.
Irvington 11, New Jersey

SALES OFFICES: Detroit • Philadelphia • Chicago • Boston
St. Louis • Buffalo • Canton • St. Paul • Pittsburgh

For further information circle No. 25 on the Reader Service Card



15 LINDBERG 2-CHAMBER INDUCTION MELTING FURNACES IN ONE DIE-CASTING PLANT....

One of the nation's newest die-casting plants uses 15 Lindberg Two-Chamber Furnaces in their die casting operations. These furnaces, operating on a 24 hour a day schedule have the capacity to melt 150,000 lbs. of alloy per day. Each furnace serves a separate die casting machine to produce these production advantages . . .

No melting room needed—all metal is melted at the casting machine, eliminating the need for carrying hot metal through the plant.

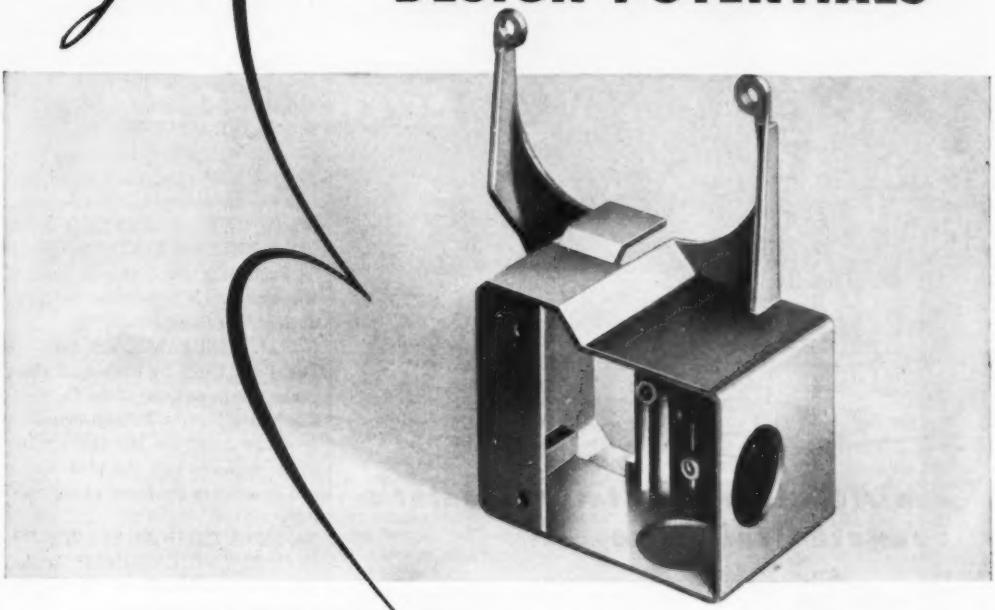
No scrap sorting—scrap metal and reject castings never leave the machine, allowing the use of a different alloy in each machine if necessary, while completely eliminating scrap sorting, handling and identification problems.

Unified production unit—each die casting machine becomes a unified production unit—receiving cold alloy ingot, melting, holding, casting, inspecting, reclaiming scrap metal and reject castings—delivering only the finished casting to the production line. Obviously the savings realized are spectacular.

LINDBERG-Fisher MELTING FURNACES

Lindberg Engineering Co., 2463 W. Hubbard Street, Chicago 12, Illinois
For further information circle No. 40 on the Reader Service Card

Flexible DESIGN POTENTIALS



with **MADISON-KIPP** *Zinc and Aluminum* **DIE CASTINGS**

The function and also the position of a component often establish a very irregular shape, like the add-on control here illustrated. The Madison Kipp die casting process is ideal for producing these "special" shapes and offers the designer great flexibility without cost penalty. Please send all inquiries to our home office in Madison, Wisconsin.

MADISON-KIPP CORPORATION

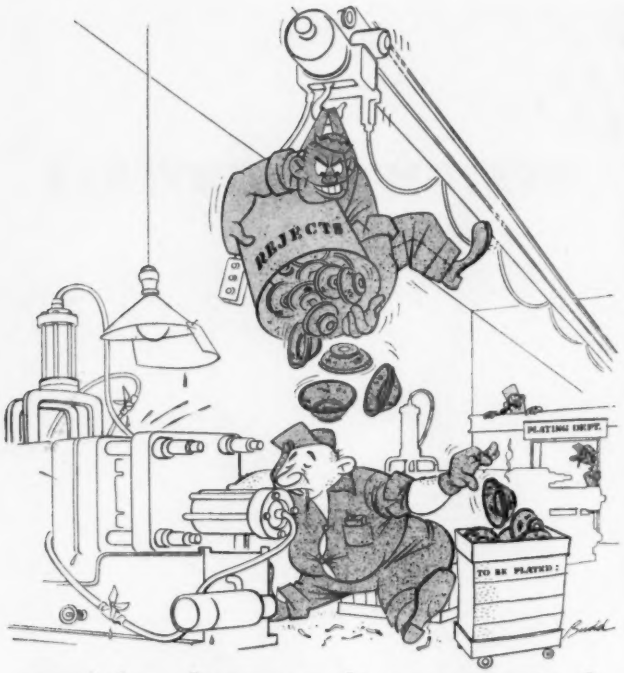
213 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

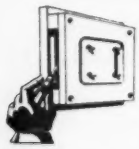
For further information circle No. 42 on the Reader Service Card



aspirin alone won't cure Castor's headache this time

1. Dip blow pipe in Die Slick

2. Spray sparingly over die cavity face



3. Spray on ejector mechanism

And when a run of dirty, unplatable castings makes your plating department want to do this sort of thing, it's time to forget drugstore remedies and lick the whole headache with Die Slick.

Die Slick puts an end to stains, ground-in dirt, and poor surface finish—stops most plating problems before they arise. It knocks out the costly headaches of sticking, soldering, scoring, and other faults due to improper die lubrication. Unlike part-time lubricants, each of the five grades of Die Slick is uniform—standardized to do its job all the time—and is used by nearly four out of every five die casters because of proved performance.

Try Die Slick on a no-risk basis. Specify the quantity you desire and the type of alloy on which you will use it. If you're not fully satisfied, simply return the unpaid invoice.

start every job with **DIE SLICK**

the industry's standard die lubricant

G. W. SMITH & SONS, INC., 5403 Kemp Road, Dayton 3, Ohio

Sole Importer for Great Britain: W. H. HOOKER, LTD., 4 Midland Crescent, Finchley Road, London N.W. 3

For further information circle No. 73 on the Reader Service Card

OFFERED IN THIS MONTH'S ADS

NOTE: Circle numbers on the enclosed postcard to indicate literature, samples or trial services you wish to receive.

No. 1. A SMALL DIE CASTING MACHINE that will cycle over 1000 times per hour is illustrated and described in literature offered by the A.B.C. Die Casting Machine Co. The machine is intended for use with one and two cavity dies.

No. 4. DIE CASTING, machining, painting and plating facilities of the Admiral Die Casting Corp. are shown in a bulletin offered by the company.

No. 5. "WE'RE GEARED FOR YOUR DEFENSE NEEDS" is a booklet explaining the Advance Tool & Die Casting Co.'s facilities for producing die castings.

No. 11. ASSURANCE OF SOUND DIE CASTINGS by control of alloy content is the purpose of the Certified Zinc Alloy Plan. A bulletin available from the American Die Casting Institute explains how the plan works and its value to the buyer of die castings.

No. 15. "A CRITICAL SURVEY OF INVESTMENT CASTINGS" is the title of a booklet offered by the Arwood Precision Casting Corp.

No. 17. "QUALITY PRECISION INVESTMENT CASTINGS FOR INDUSTRY" explains how plaster mold castings can be used in various industrial applications. It is available from the Atlantic Casting & Engineering Corp.

No. 30. SAMPLES OF TINY DIE CASTINGS and bulletins covering production facilities are offered by the Gries Reproducer Corp. This company specializes in very small zinc die castings.

No. 34. DIE CASTING MACHINES for zinc, aluminum, brass and magnesium alloys are described and illustrated in Bulletin 5106, available from the Hydraulic Press Mfg. Co.

No. 36. THE INVESTMENT CASTING PROCESS is described and explained in a booklet available from the Investment Casting Co.

No. 39. DIE CASTING MACHINES made by the Kux Machine Co. are shown and described in a catalog

DIE CASTING filters out production bugaboos

Eddington S-254 Fuel-Oil Filter, die cast from aluminum by Mount Vernon

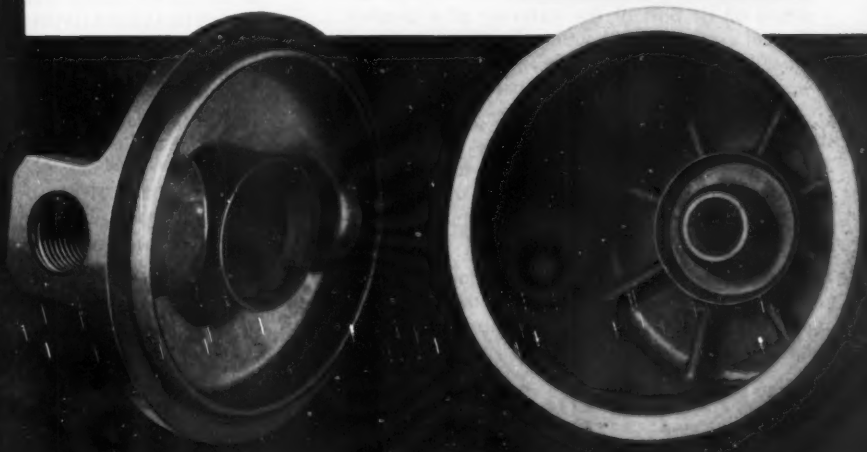
CASE HISTORIES FROM MT. VERNON FILES

Too many operations; too many man hours; too much waste of materials. These are the bugaboos that tend to plague every production line and raise unit costs. But with die casting, you can filter them all out—simplify and speed production while conserving every possible ounce of material.

The Eddington Fuel-Oil Filter shown here is die cast by Mount Vernon in two pieces, a cartridge container and cap that make perfect oil-tight fit. Note the built-in cartridge seat with single bolt construction, and the flanges that give strength to the base of the container while providing a spacious sludge and water sump. Also the inlet, outlet and cartridge-retaining elements integral with the cap. Every feature is produced simultaneously and instantly, as the die closes . . . and so "clean" that subsequent machining is virtually eliminated.

Says Eddington Metal Specialty Co. of Eddington, Pa.: "Our specially engineered filters for heating oils are die cast, because die casting gives a superior product over other possible methods of manufacture—proves most economical—gives volume output in minimum time—reduces the need for machining to a minimum."

And Eddington's experience is repeated again and again in a host of applications in different fields. If you have not already profited from the many advantages inherent in die casting, why not utilize this versatile, cost-cutting medium? We shall be glad to put our wealth of experience at your disposal, and make recommendations based on your specific needs.



For further information circle No. 54 on the Reader Service Card.

A pleasing exterior

...IS OFTEN THE RESULT OF DIE CASTINGS *by* MILWAUKEE

One big advantage of the die casting process is the fact that it usually permits exact interpretation of the product designer's ideas.

This is especially desirable when die castings constitute all or part of the exterior of a product. Typical examples are housings for gears, motors or other mechanisms; levers, control knobs or handwheels; end-plates, covers or bases.

When die castings are used for such parts, the designer usually has wide latitude in combining curves, contours and plane surfaces to achieve results that are pleasing to the eye, and pleasing to the touch, or which contribute to more comfortable control or operation.

Here at *Milwaukee*, a pleasing exterior has always been an important consideration in the design and production of die castings which add to the eye appeal or touch appeal of the finished product.

MILWAUKEE DIE CASTING COMPANY
1019 N. FOURTH STREET • MILWAUKEE 3, WISCONSIN

For further information circle No. 50 on the Reader Service Card

offered by the company.

No. 41. LITERATURE AND DESIGN INFORMATION on aluminum and magnesium die castings are available from Litemetal Dicast, Inc.

No. 43. FILTERS FOR HYDRAULIC SYSTEMS are described in Folder 105, offered by the Marvel Engineering Co. These filters have no moving or wearing parts.

No. 45. IMPREGNATION OF POROUS CASTINGS by the Mogullizing system is explained in literature offered by the Metallizing Company of America.

No. 48. EQUIPMENT FOR DIE CASTING made by the Miller-Taylor Tool Co. is illustrated and described in literature offered by the company. The company makes zinc and aluminum die casting machines in several sizes.

No. 49. MELTING KETTLES, HOLDING POTS and other equipment for handling molten non-ferrous metals is illustrated and described in Catalog No. 101, offered by the C. H. Milles Foundry Co.

No. 52. A FOLDER DESCRIBING THE MONARCH Aluminum Mfg. Co.'s plant and its zinc and aluminum die casting facilities is available from the company.

No. 57. "HOW TO DIMENSION PRINTS FOR DIE CASTING" is the title of a booklet offered by the Newton-New Haven Co. The booklet gives detailed instructions for guidance in dimensioning die casting drawings.

No. 53. PYDRAUL F-9 HYDRAULIC FLUID is described in Technical Bulletin No. O-75, available from the Monsanto Chemical Co. F-9, a nonflammable compound, was developed primarily for use in die casting machines.

No. 63. INFORMATION ON INVESTMENTS for casting with the lost wax process is offered by Pre-Vest, Inc. This company specializes in the production of investments for ferrous and non-ferrous investment casting.

No. 66. "MODERN PRECISION INVESTMENT CASTING" is the title of a booklet offered by Alexander Saunders & Co. This company manufactures investment casting equipment and supplies.

KIOWA

"Precision from Print to Product"

Assures a Steady Supply of Quality Components

Each machine in Kiowa's custom-built battery of high pressure die casting machines is electrically timed to assure consistent production of top quality die castings. Skilled operators quickly remove the casting from the die and start the machine on the next cycle.

- **Zinc Base Die Castings**
- **Aluminum Gravity Die Castings**
- **Brass, Bronze, Aluminum Sand Castings**

The precision and quality of Kiowa's men and equipment mean that Kiowa customers enjoy every benefit to be obtained from having a dependable source of quality components.

Visual inspections as well as close-tolerance gauge checks are constant and important factors in the production of Kiowa quality castings.

KIOWA CORPORATION

For further information circle No. 38 on the Reader Service Card

DEPENDABLE
BETTER METHODS
SUPER CAST
DIE CASTINGS
BETTER DIE CASTINGS
SINCE 1919

The meaning of a signature!

Through a quarter of a century of knowing how, the SUPER CAST reputation for Better Methods—Better Die Castings, has been recognized.

Sound engineering, metallurgical knowledge and skilled techniques have achieved and maintained a standard of superior quality.

SUPER CAST has kept faith, always deserving the mark it bears. SUPER CAST means die castings for those who want the best.

A sound, time-tested institution and a sound time-tested product have won confidence and widespread endorsement.

THE SUPERIOR DIE CASTING COMPANY
1001 London Road CLEVELAND 10, OHIO
Detroit Chicago Pittsburgh
Philadelphia New York

For further information circle No. 72 on the Reader Service Card

No. 76. EXAMPLES OF DIE CASTINGS in zinc and aluminum made by the Tri-State Die Casting Corp. are presented in a catalog offered by the company.

No. 78. INVESTMENT CASTING PATTERNS can be made from styrene on a plastic molding machine. Information on machines designed for this purpose can be obtained from the Van Dorn Iron Works Co.

No. 81. BURNISHING BALLS AND SHAPES and suggestions on how to use them are contained in a catalog issued by the Abbott Ball Co. The company manufactures burnishing shapes made of bearing ball steel in many shapes and sizes.

No. 82. ENAMEL FILLING OF RECESSES in die cast parts is illustrated and described in literature available from the Acromark Co.

No. 84. "ADVANCED BARREL FINISHING" is the title of a booklet offered by Almco Division, Queen Stove Works, Inc. The booklet gives details of the Supersheen method of controlled barrel finishing.

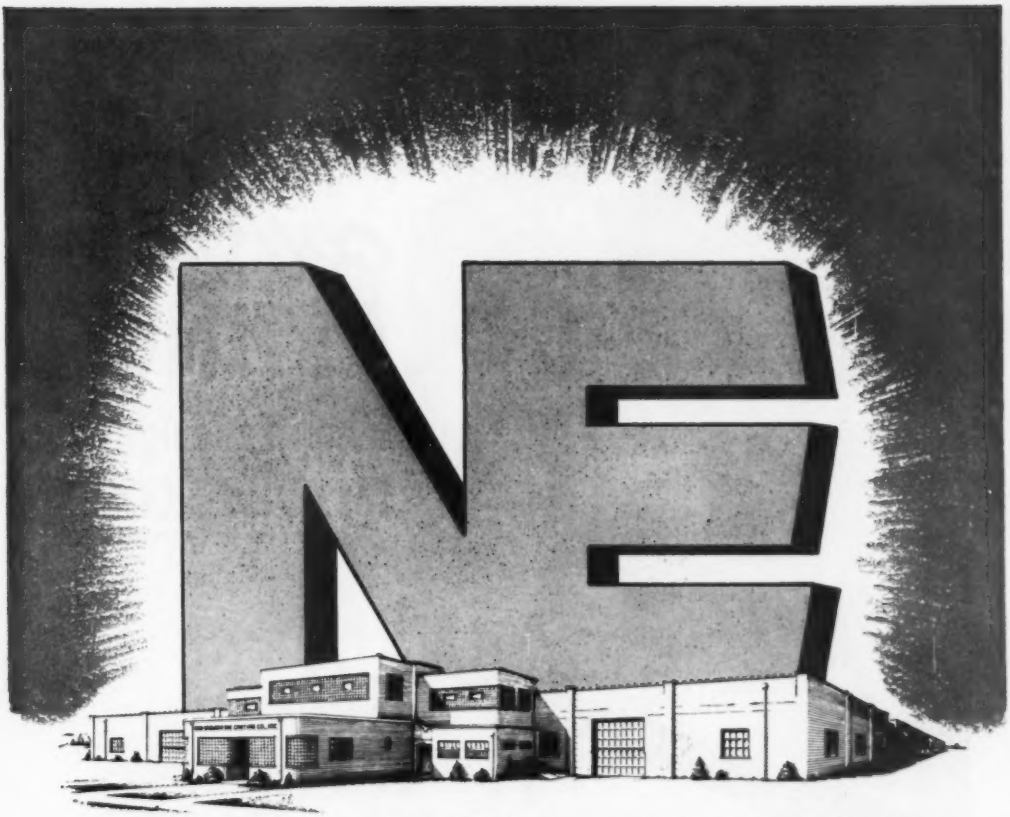
No. 83. A BRIGHT CHROMATE FINISH called Iridite is manufactured by Allied Research Products, Inc. Full information and free samples or processing are available.

No. 85. BACKSTAND BELT GRINDING AND POLISHING and its advantages over other methods are discussed in a Coated Abrasives Div., Armour & Co., booklet. The booklet also shows equipment needed for backstand belt work.

No. 86. CASE STUDY DISCUSSIONS of metal finishing problems and their solutions are included in a booklet titled "Blueprints for Faster, Better Production", available from the Behr-Manning Corp. The booklet can be folded out into a wall chart.

No. 88. DETAILS ON MASKING FIXTURES for all types of spray painting operations are offered by the Conforming Matrix Corp. Information is also offered on standard and specialized spray painting machines incorporating masking fixtures.

No. 89. AM CLEANER, a non-etching cleaner specifically compounded for aluminum alloys, is covered in technical data sheets available from the Cowles Chemical Co.



ZINC AND ALUMINUM DIE CASTINGS

The largest and most modern die casting plant in the New England States

Chas. W. Ohse, President

"The Inside Story"

See for yourself the complete modern facilities and services which are available at New England. Write on company letterhead for your copy of our brochure which illustrates and describes our operation.

THE NEW ENGLAND DIE CASTING CO.

445 FRONT AVENUE • WEST HAVEN, CONNECTICUT

For further information circle No. 55 on the Reader Service Card

consider DIE CASTING when redesigning for LOWER COSTS

THE DIE CASTING PROCESS: Speed of production is the essence of the die casting process—the shortest distance between raw material and finished product; it is a precision, low-unit labor process, capable of producing direct from the raw material the most complex parts in nearly finished form at a single operation.

ZINC DIE CASTINGS: Zinc is the most adaptable metal for the die casting process and provides the best combination of physical and chemical properties. Zinc die castings are stable, strong, and can be cast to close tolerances; they are easily machined and a large variety of beautiful metallic and organic finishes can be readily applied to the castings.

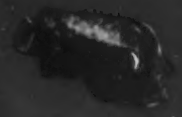
Industry's recognition of these factors is indicated by the phenomenal growth of die casting as a production tool plus the fact that nearly 75% of all die castings by weight are made of zinc. **DIE CASTING is the Process • ZINC, the Metal • BUNKER HILL, the Preferred Zinc**

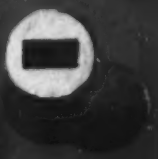
BUNKER HILL 99.99+% ZINC

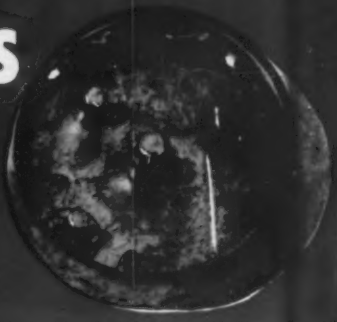
EASTERN SALES AGENTS ST. JOSEPH LEAD COMPANY 250 PARK AVENUE, NEW YORK 17
SALES OFFICE FOR PACIFIC COAST NORTHWEST LEAD COMPANY SEATTLE, WASHINGTON

For further information circle No. 65 on the Reader Service Card

ADVANCE HAS THE RIGHT COMBINATION FOR TOUGH PRESSURE CASTINGS





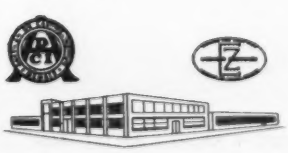


Leading manufacturers turn to ADVANCE PRESSURE CASTINGS for the solution of their special casting problems.

Working together with Eagle Lock Co. engineers, our own staff tackled the intricacies of the various castings required for the many types of Eagle locks. The result . . . such special castings as plugs with wafer slots cored right in; cast dials complete with numbers; multi-impression dies used on all parts with complete interchangeability of ALL impressions making for LOW piece price and LOW assembly costs.

Another triumph for the adaptability of die castings, Eagle locks are primary evidence of the advantages offered by ADVANCE PRESSURE CASTINGS with its own complete facilities, from blueprint to finished product.

Whatever your problem, consult with ADVANCE PRESSURE CASTINGS for your proper combination—without obligation, of course.



ADVANCE PRESSURE CASTINGS Inc.

20-30 Wythe Ave., Brooklyn 11, N. Y.

FOR QUALITY PRODUCTION

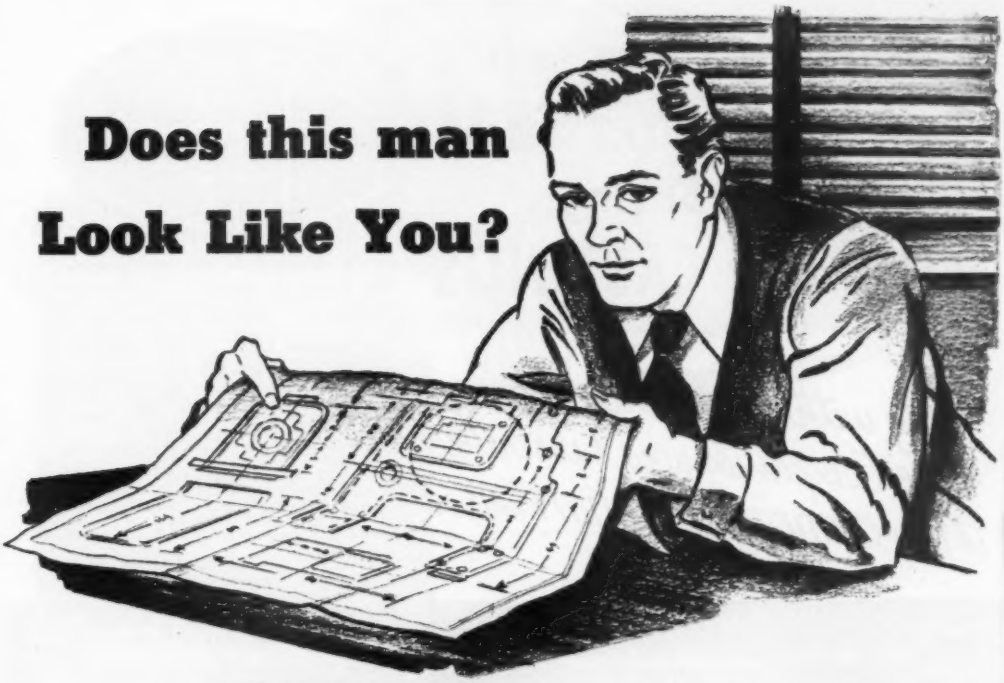
99.99+% ZINC

AMERICAN ELECTROLYTIC

AMERICAN ZINC SALES COMPANY
Distributors for
American Zinc Lead & Smelting Co.
Columbus, Ohio • Chicago • St. Louis • New York

For further information circle No. 13 on the Reader Service Card

Does this man Look Like You?



at PARKER he is you!

THIS man takes **your** place at Parker. His title?—Testing Chief. At regular intervals during the production of your die castings, your "representative" checks material tests, designs, tolerances and specifications. He is constantly watchful that your exact requirements are being met. He is literally serving two masters—for through his careful scrutiny of every job your satisfaction is guaranteed, and Parker's facilities are kept at a peak of efficiency. This is another instance where Parker's half-century of experience pays off for **you**. Call the Parker representative on your next die casting problem.

And when you think of Die Castings -- THINK OF

OLLIE J. BERGER COMPANY, 139 North Clark Street, Room 1415, Chicago 2, Ill. Dearborn 2-4954 • O. H. BROXTERMAN & SON, 2174 Buck Street, Cincinnati, Ohio Cherry 1623 • H. R. LaMONTAGNE, P. O. Box 969, 76 Mill Street, Springfield, Mass. Phone 6-3642 • J. C. PALMER, P. O. Box 971, Rochester 3, N. Y. Monroe 1209 • G. L. PALMER, 97 Spring St., Metuchen, N. J. Phone 6-0525 • MR. J. G. HODGSON, 2832 East Grand Blvd., Detroit 11, Michigan Trinity 1-9385 • EDWARD F. HIGGINS, JR., 4931 Laclede Avenue, St. Louis 8, Mo. Forest 6541 • LARRY WARD, 1500 LaSalle Avenue, Minneapolis, Minn. • WARREN OLSON, 612 E. Bishop Street, Bellefonte, Pa. Phone 2951 • D. F. MARSH, 35 Chestnut St., Girard, Penna. Phone 528R Girard, Pa.

Parker White-Metal Company • 2153 McKinley Ave. Erie, Penna.

PARKER ALUMINUM and ZINC *Die Castings*

Now more than ever
Look for this SEAL
When Buying
ZINC DIE CASTINGS

CERTIFIED ZINC ALLOY PLAN

LICENSED PRODUCER

AMERICAN DIE CASTING INSTITUTE

Buy with Confidence from these Companies who subscribe to the CERTIFIED ZINC ALLOY PLAN...

A & A Die Casting Co., West Los Angeles, Calif.
The Accurate Die Casting Co., Cleveland, Ohio
Advance Pressure Castings, Inc., Brooklyn, N. Y.
Advance Tool & Die Casting Co., Milwaukee, Wis.

Badger Die Casting Co., Milwaukee, Wis.

Central Die Casting & Mfg. Co., Inc., Chicago, Ill.
Cleveland Hardware & Forging Co., Cleveland, Ohio
Congress Drive Division, Tann Corp., Detroit, Mich.
Continental Die Casting Corp., Detroit, Mich.
Division of U. S. Castings Co.
Crown City Die Casting Co., Pasadena, Calif.

Doehler-Jarvis Corp., Patterson, Penna.
Doehler-Jarvis Corp., Toledo, Ohio
Doehler-Jarvis Corp., Chicago, Ill.
Dulin Corporation, Irvington-5, N. J.
Du-Wel Metal Products, Inc., Bangor, Mich.

Fenner Manufacturing Co., Inc., Wenner, Calif.
Federal Die Casting Co., Chicago, Ill.

Gamble Products Corporation, Detroit, Mich.
Glass Industrial Corporation, Rockford, Ill.
G. W. Gray Mfg. Co., East Orange, N. J.

Hayes Die Casting Corporation, Chicago, Ill.
Hollinger Corporation, Toledo, Ohio
The Hoover Company, North Canton, Ohio

Kenosha Die Casting & Mfg. Co., Chicago, Ill.
Kloss Corporation, Maquoketa, Iowa
Paul Kress Die Casting Co., Chicago, Ill.

Madison-Kipp Corporation, Madison, Wis.
Milwaukee Die Casting Co., Milwaukee, Wis.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Mt. Vernon Die Casting Corp., Mt. Vernon, N. Y.

New Products Corp., Benton Harbor, Mich.

Paragon Die Casting Co., Chicago, Ill.
Parker-White Metal Co., Erie, Penna.
Precision Castings Co., Inc., Syracuse, N. Y.
Precision Castings Co., Inc., Cleveland, Ohio
Precision Castings Co., Inc., Reed Metal Crafts Division, Chicago, Ill.
Pressure Castings, Inc., Cleveland, Ohio

Racine Die Casting Co., Racine, Wis.

St. Louis Die Casting Corp., St. Louis, Mo.
Schaefer Die Casting Co., Chicago, Ill.
Sterling Die Casting Co., East Rochester, N. Y.
Stewart Die Casting Division of Stewart Warner Corp., Chicago, Ill.
Syracuse Die Casting Division of Crouse-Hinds Corp., Syracuse, N. Y.

Thomas Die Casting Co., Kenosha, Wis.
Thompson Die Casting Co., Detroit, Mich.
The Tool-Die Engineering Co., Cleveland, Ohio
Twin City Die Casting Co., Minneapolis, Minn.

Union Die Casting Co., Inc., Los Angeles, Calif.
Universal Die Casting Co., Los Angeles, Calif.

Wells Die Casting Co., San Francisco, Calif.
Western Die Casting Co., Brownsville, Calif.

1. Whether for military or essential civilian requirements, die castings obtained from any of the companies listed here fulfill *all* ASTM specifications.

2. Regular sampling and analysis assure conformance to definite composition limits . . . alloy used is proved to be "on grade."

3. Only those suppliers of zinc die castings whose names appear here are licensed to use the Quality Certification Seal.

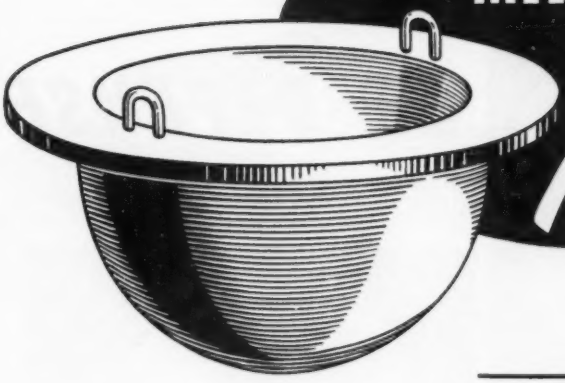
4. NOW, MORE THAN EVER, you must be sure that your castings are manufactured in a plant which maintains proper alloy control. The CERTIFIED ZINC ALLOY PLAN gives you this assurance.

Send for a bulletin fully describing The CERTIFIED ZINC ALLOY PLAN, how it operates and what it means to the buyer

AMERICAN DIE CASTING INSTITUTE, INC.
366 MADISON AVENUE NEW YORK 17, N. Y.
D CI

For further information circle No. 11 on the Reader Service Card

FOR THE BEST IN MELTING EQUIPMENT SPECIFY *Milles*



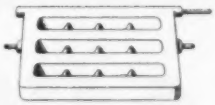
COMPLETE LINE OF MELTING EQUIPMENT FOR DIE CASTERS, NON-FERROUS FOUNDRIES, AND SMELTERS

• Melting Kettles • Ingot Molds • Pallet Molds • Slag Buggies • Enameled Ladle Bowls • Enameled Kettles • Enameled Thermocouple Protecting Tubes • Milles "Ferrisist" Ladle and Kettle Wash • Enameled Pouring Ladles • Salem Pressed Steel Ladles • Melting Kettles and Skimmers • Universal Mold Compound

Get Catalog No. 101 for detailed information on our complete line of melting equipment.

NEW YORK REPRESENTATIVE — FRED W. HARMON
15 ARDMORE ROAD • SCARSDALE, NEW YORK
TELEPHONE 3-6669

1. IRON OR PRESSED STEEL POURING LADLES



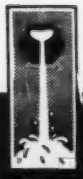
4. WATER COOLED MOLDS

2. PRESSED STEEL LADLES

5. IRON MOLDS FOR ALL NON-FERROUS METALS

3. CAST IRON POURING LADLE

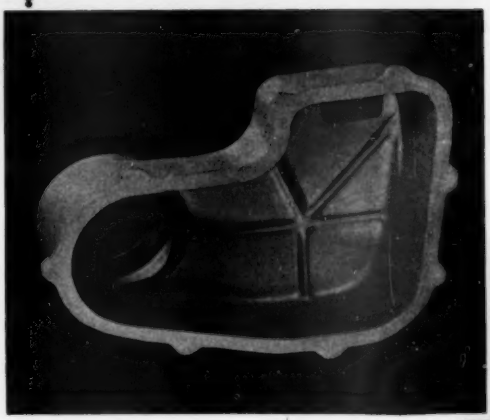
6. THERMOCOUPLE PROTECTING TUBES. STANDARD TUBES ARE 1¼" O.D. THREADED FOR ¾" PIPE. STANDARD LENGTHS RUN FROM 12" TO 48"



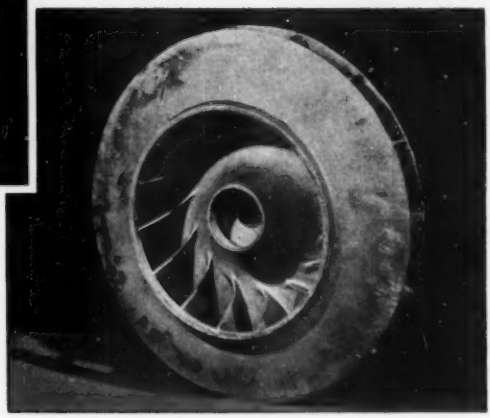
C. H. MILLES FOUNDRY COMPANY
MANUFACTURERS OF SPECIAL ALLOY HEAT RESISTING IRON
2201-25 WEST 35TH STREET • CHICAGO 9, ILLINOIS • LAFAYETTE 3-7255

For further information circle No. 49 on the Reader Service Card

FOR PEACE



OR DEFENSE



ACME

has the experience

FROM a single source you can get aluminum alloy permanent mold and semi-permanent mold castings, plus aluminum and magnesium alloy sand castings.

During World War II Acme produced a wide variety of castings for aircraft and aircraft accessories and for numerous complicated ordnance parts. Production on some of these parts has never been discontinued.

This experience and our engineering knowledge is available to you. Acme engineers will work with you on problems of design, cost of producing samples, production costs and cost of patterns or permanent molds to produce high quality castings.

★ ★

A COMPLETE LIGHT METAL CASTINGS SERVICE

ACME

ALUMINUM FOUNDRY CO.

6841 SOUTH BELL AVENUE

CHICAGO 36, ILLINOIS

TELEPHONE — PROSPECT 6-5035

For further information circle No. 3 on the Reader Service Card

From Blueprint to Finished Part

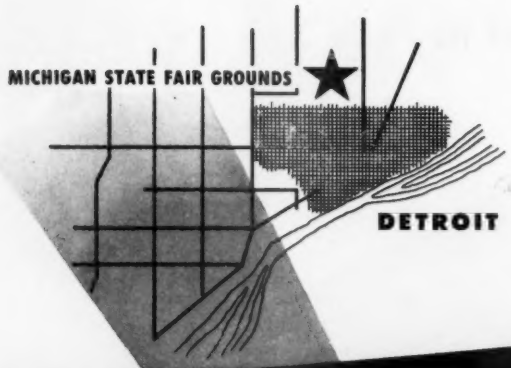
For Military or Essential Civilian Zinc Alloy Die Castings Consult

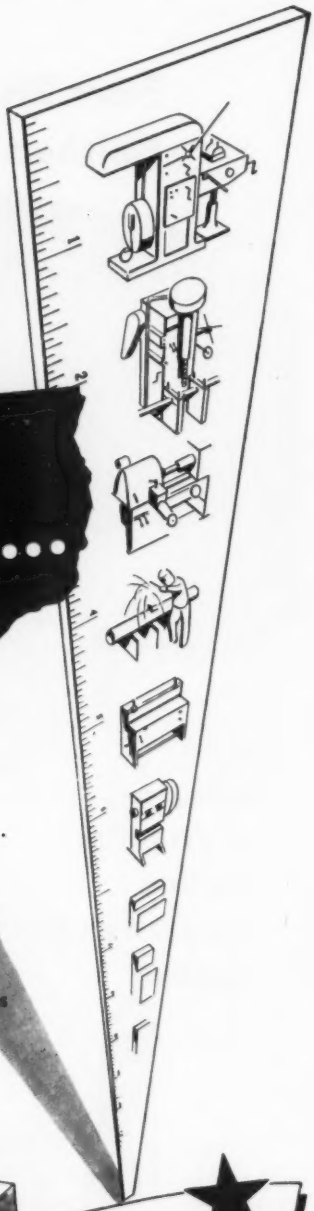
SCHULTZ

Our ability consistently to furnish dimensionally accurate castings with superior surface finish has established us as a leading supplier of zinc base alloy die castings. Our engineers will welcome the opportunity of demonstrating how these advantages can be incorporated in your products.

SCHULTZ DIE CASTING COMPANY
1810 CLINTON STREET • TOLEDO 7, OHIO

For further information circle No. 67 on the Reader Service Card





Metal Yardstick– 3 MILESTONES LONG...

Milestones of metal progress . . . of metal research . . . of world-wide metal conservation and utilization . . . these are the brilliant features of the National Metal Exposition of '51 . . . features that will lend a strong lure to the nation's newest and finest achievements in the metal industry. Ask yourself where else on earth you could find concentrated in one place the best brains and the best products of a free world's finest and most basic industry. Be there!

Detroit, Mich.— Oct. 15-19

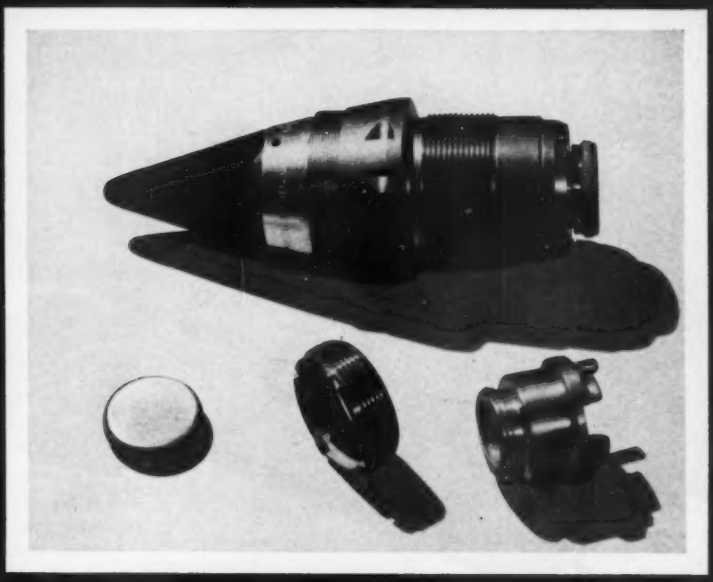
NATIONAL METAL EXPOSITION

NATIONAL METAL CONGRESS

WORLD METALLURGICAL CONGRESS

For further information circle No. 12 on the Reader Service Card

WE DID IT BEFORE...
WE CAN DO IT AGAIN!



Anti-Aircraft Fuses were one of the many items we produced in volume during World War II. Millions of them...at the rate of 48,000 per day.

Increased facilities find us even better prepared to meet today's Defense requirements. Send us your inquiries.

PRESSURE CASTINGS, INC.

die castings

ZINC AND ALUMINUM ALLOYS

CLEVELAND 19, OHIO

Wm. H. Hansen, Jr.
Sales Manager

Marshall A. Rich
Asst. Sales Manager

Irving L. Bandrich
Boston, Mass.
Commonwealth 6-2864

John D. Goodin
Indianapolis, Ind.
Talbot 9343

R. E. Zimmermann
Detroit, Mich.
Trinity 5-2474

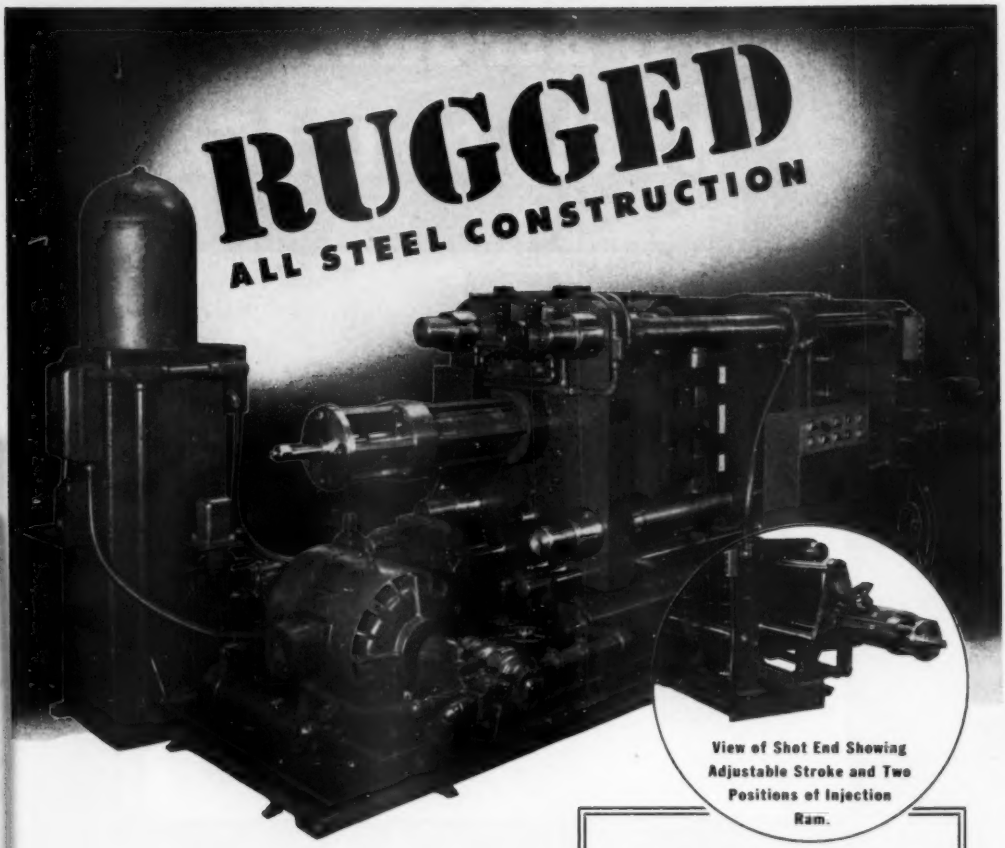
J. R. Hume
Rochester, N. Y.
Monroe 5392

E. R. Staley Co.
St. Louis, Mo.
Lucas 3155

Manufacturers Sales
Dayton, Ohio
Hudson 3-8902

John Lasky, Jr.
Camden, N. J.
Vermont 4-2215

RUGGED
ALL STEEL CONSTRUCTION



View of Shot End Showing Adjustable Stroke and Two Positions of Injection Ram.

CAST-MASTER
Die Casting Machines

Designed and built by top-notch engineers who are not only machine designers, but are well versed in every phase of die-casting. Their knowledge and "know-how" combined with hundreds of case histories on die-casting functions, have resulted in the development of the CAST-MASTER . . . a die-casting machine with a record of years of successful operation in America's foremost plants.

Constructed with New Hydraulic System that Minimizes Fire Hazards —

- **All types of ejection available. Bumper plate, hydraulic, manual rack and pinion, automatic rack and pinion.**
- **Sufficient clearance between base of machine and movable plate for core pulls or movements.**
- **Heavy duty needle bearing rollers carry the entire weight of movable plate and die. Wear is negligible on the bars and bushings. Maintains die alignment.**
- **Entire hydraulic unit accessible for maintenance or inspection.**
- **Two injection positions of shot cylinder. One on center — one below center — rapid change-over to either position.**

Write For Complete Specifications!

MILLER-TAYLOR TOOL CO. 5005 Euclid Ave., Cleveland 3, Ohio

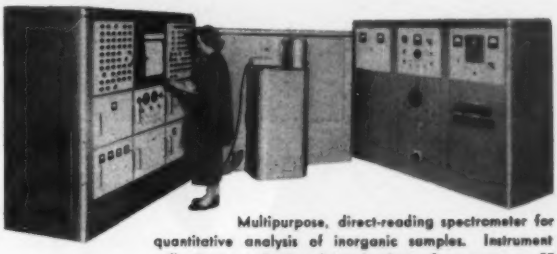
For further information circle No. 48 on the Reader Service Card

SPECTROGRAPHERS—

choose your spectrochemical equipment from the most complete line

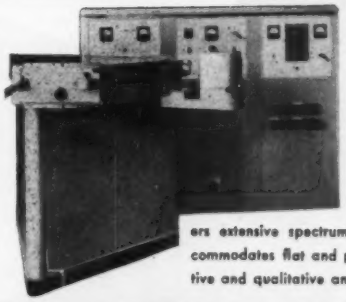
ARL offers you the most advanced types of instruments and related equipment

Production Control Quantometer analyzes metals in two minutes



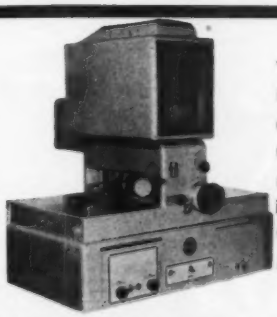
Multipurpose, direct-reading spectrometer for quantitative analysis of inorganic samples. Instrument will give quantitative determinations of as many as 25 elements as selected by the user—up to 20 simultaneously. Designed for routine production control and research analysis. Each instrument is designed to meet your specific analytical requirements.

Original Grating Spectrographs — 1.5 and 2 meters



Extremely compact and versatile. Uniform dispersion over entire spectrum range. Original grating gives marked superiority in detecting elements in low concentrations. Paschen mounting for camera covers extensive spectrum range. Excitation stand accommodates flat and pin samples for both quantitative and qualitative analyses.

Film Comparator-Densitometer — Easy to identify and measure density of spectrograms



This instrument is manufactured to the highest ARL standards, permitting the most accurate qualitative and quantitative analyses, based upon spectrum line positions and densities. It is easy to adjust and the image is located in a non-fatiguing position. As many as 6 lines per minute can be easily read.

The ARL line, manufactured by the world's largest producer of this type of equipment, also includes Source Units and related Spectrochemical accessories. Write today for complete details.

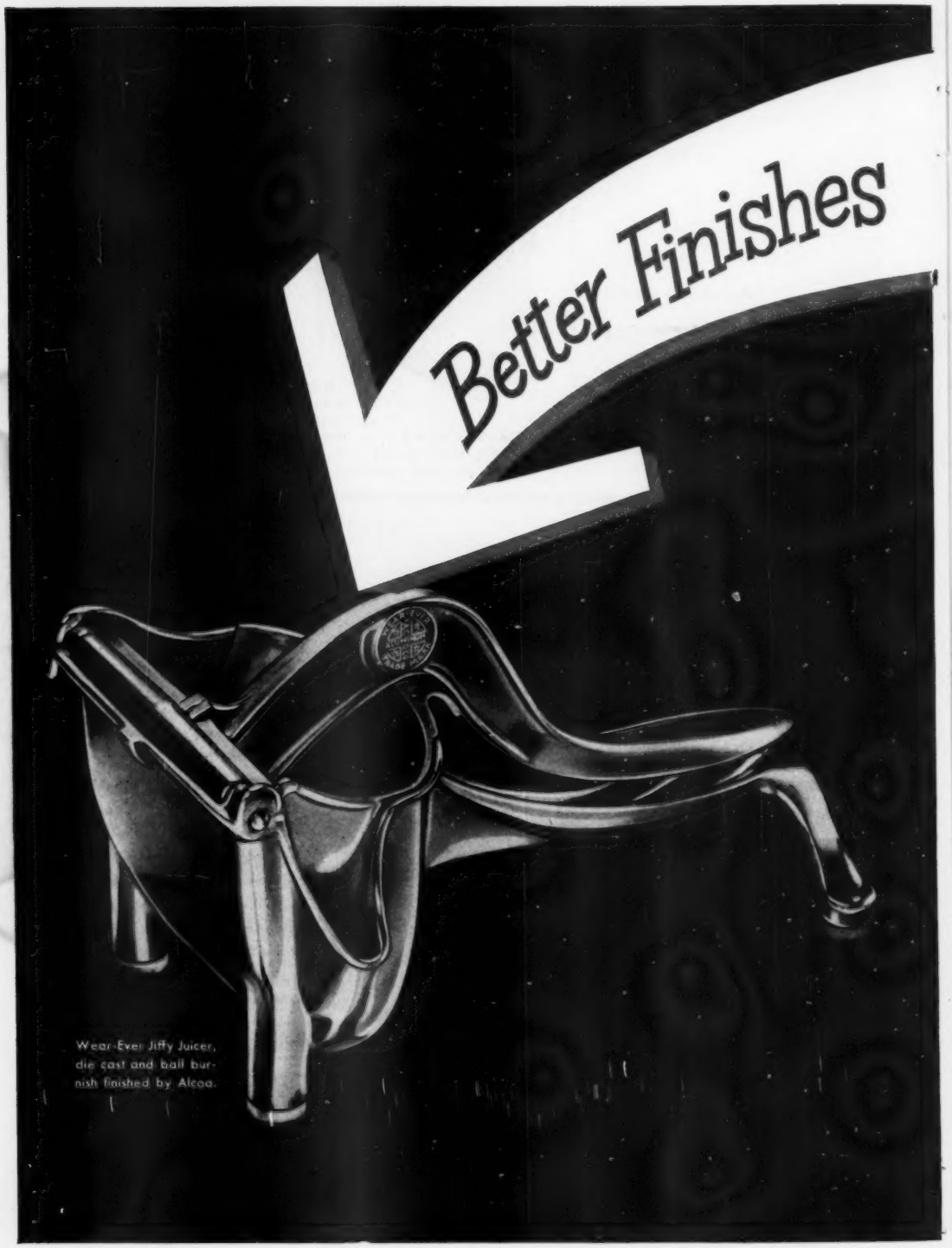
Applied Research Laboratories

SPECTROCHEMICAL EQUIPMENT

4336 SAN FERNANDO ROAD • GLENDALE 4, CALIFORNIA

NEW YORK • PITTSBURGH • DETROIT • CHICAGO • LOS ANGELES

For further information circle No. 16 on the Reader Service Card


Better Finishes
Wear-Ever Jiffy Juicer, die cast and ball burnish finished by Alcoa.

Another advantage of ALUMINUM die castings made by ALCOA

No matter how many calls we make, we still find designers who feel that aluminum die castings are difficult to finish.

But the fact remains that all finishes—painted, plated, anodized, mechanical and chemical—*are practical and economical for aluminum.* And that these finishes are extending the use of Alcoa Die Castings to new fields—through better appearance, better corrosion resistance, better abrasion resistance.

The best way to investigate finishes for Alcoa Die Castings is to talk over your product with an Alcoa specialist. From the many Alcoa-Developed Alloys, he'll help you select the one that meets your finishing needs without sacrificing mechanical requirements or boosting the casting's cost. You'll find him listed under "aluminum" in your classified phone book.

Or write: ALUMINUM COMPANY OF AMERICA, 1895K Gulf Bldg., Pittsburgh 19, Pa.

PAINTED—The cast surfaces of Alcoa Die Castings provide good adherence for paint, enamel and lacquer. Precaution should be taken to remove any oil from the casting. Special pretreatment is not usually required.

MECHANICAL—Ball burnishing gives a lustrous, slightly work-hardened surface to aluminum die castings. It requires very little investment in physical equipment or man hours. Other economical mechanical finishes include polishing and scratchbrushing.

ANODIZED—Anodic coatings are hard and smooth—integral with the metal. They will not chip or peel. Besides increasing the casting's resistance to corrosion and abrasion, they add interesting decorative effects. The black finish is most widely used on Alcoa Die Castings, but a wide range of colors is also available.

PLATED—Alcoa Die Castings may be plated with chromium, nickel, copper, gold or silver, just as die castings of other metals. The Alcoa-Developed zinc immersion process makes electroplating economical and practical on aluminum.

ALCOA

MAKES ESSENTIAL DIE CASTINGS FOR MILITARY AND NON-MILITARY USES

ALUMINUM & MAGNESIUM

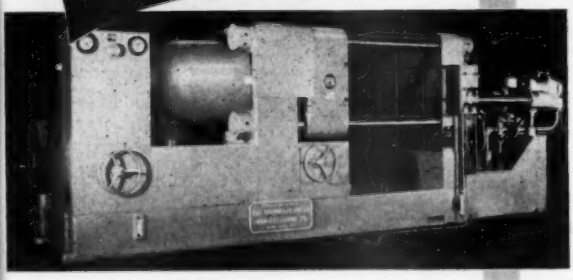
For further information circle No. 7 on the Reader Service Card

H-P-M's that Speed Up Die Casting PRODUCTION!

Whatever your production picture—large or small—there's an H-P-M die casting machine to bring in new profits. Follow the lead of Hoover, Westinghouse, General Electric, Western Electric, Chrysler, Emerson Electric, and many others for new production "highs" with H-P-Ms.

150-A For Small Die Castings

400-A For Big Die Castings



CHECK THESE H-P-M DESIGN FEATURES

THE H-P-M ALL-HYDRAULIC MOLD CLAMP, guided by four strain rods, assures positive mold alignment. Die change-over is simple and fast. Both clamp stroke and pressure are adjustable. Positive overload protection is provided at all times. High speed closing and opening, with automatic slow-down prior to mold contact, guarantees fast, shockless operation.

H-P-M AUTOMATIC CYCLE CONTROL permits maximum production. Manual effort has been minimized. Electric hand switches control mold clamp, hydraulic ejector and core pulls. A single Multiflex timer controls the automatic cycle after metal has been ladled into "cold" chamber. A selector switch is provided for manual operation of entire cycle, if desired.

THE H-P-M HYDRO-POWER OPERATING SYSTEM provides a direct and compact source of hydraulic power. All pumps, valves and controls are built by H-P-M for heavy duty service. Undivided responsibility to the user is guaranteed. Each pump is equipped with convenient volume and pressure controls. Only electric power and cooling water are required to operate these self contained machines.

Write today for Bulletin 5106, or better yet, call in an H-P-M engineer to discuss your particular problems.

SPECIFICATIONS

	MODEL NUMBER				
	150—A	150—Z	400-A-M	400-A-S	400—AV
SIZE OF DIE PLATES	24½x24½	24½x24½	38x38	45x45	36x36
SPACE BETWEEN BARS	15½x15½	15½x15½	23x23	30x30	36x36
DIE OPENS	12	12	16	16	20
MAXIMUM DIE SPACE	28	28	42	42	42
CAPACITY PER SHOT (LBS.)	4 (AL)*	10 (ZN)	12 (AL)*	12 (AL)*	12 (AL)*
NET WEIGHT (LBS.)	13000	16000	40000	44000	33000

*NOTE: These models handle brass and magnesium die castings as well. Complete specifications on request.

THE HYDRAULIC PRESS MFG. CO.

HYDRAULIC MACHINERY

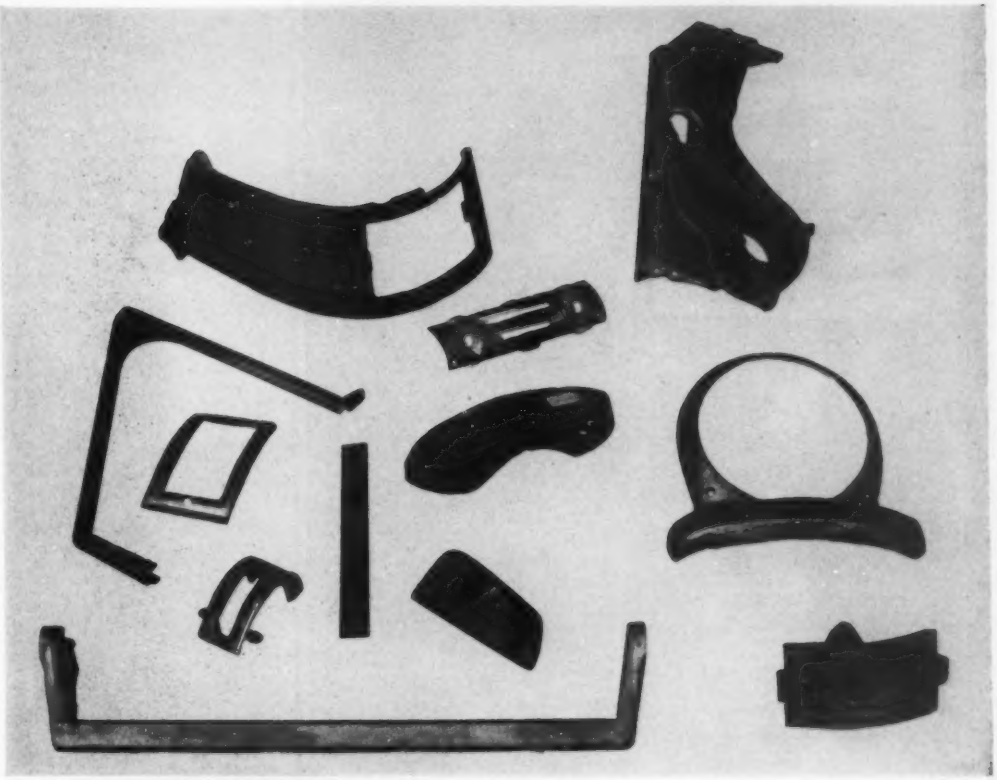
HPM

1094 Marion Road • Mount Gilead, Ohio

PUMPS • VALVES • MOTORS

Revolutionizing Production with Hydraulics Since 1877

For further information circle No. 34 on the Reader Service Card



GO NU-MOLD

MANUFACTURERS—

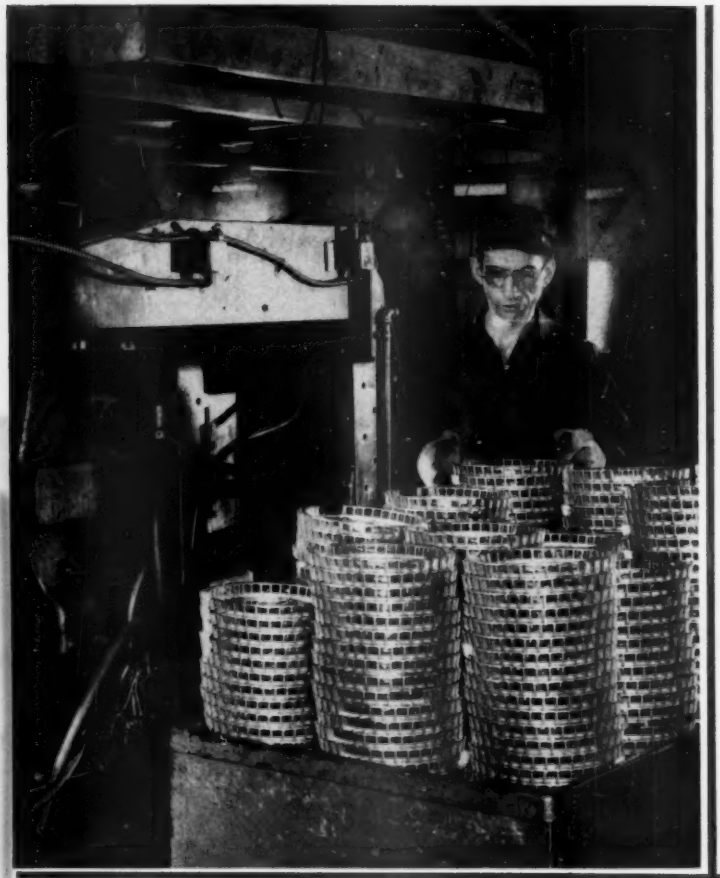
Use our new mold development for precision experimental and sample castings for all types of cast products on pilot jobs and initial short runs for show purposes.

We produce prototype from all types of models and patterns in all non-ferrous metals. Our products are ready for polishing and plating, eliminating 95% of machining. Thin or thick wall castings, no problem.

Inquiries solocited.

PRESSURE CAST PRODUCTS CORPORATION
1030 VERMONT AVENUE DETROIT 16, MICH. Tel. TAshmoo 5-8188

For further information circle No. 61 on the Reader Service Card.



Just drain and refill...for safety

For greater *safety* for employes . . . greater *safety* for equipment . . . greater *safety* for buildings . . . just drain your hydraulic systems and refill with Monsanto's Pydraul F-9.

Nonflammable-type Pydraul F-9 is designed for machines requiring a fluid power-transfer medium. You can convert to its use without changing equipment.

The nonflammability of Pydraul F-9, the key to greater safety, has been proved in numerous tests such as the following:

Pydraul F-9 did not flash or ignite when sprayed, dripped or flooded on molten metal heated to approximately 1,500° F.

Pydraul F-9 did not flash or ignite when sprayed, at 1,000 p.s.i., into the 6,000° F. zone of an oxyacetylene welding torch flame.

You get a bonus of *efficiency* and *economy* in addition to *safety* when you change to Pydraul F-9. The fluid shows high resistance to mechanical shear and chemical breakdown. It is high in lubricity and does not corrode metals from which machines ordinarily are constructed.

Why not investigate Pydraul F-9 today. See what it offers you in greater *safety* and assurance of uninterrupted production. For details contact the nearest Monsanto Sales Office or write for a copy of Monsanto Technical Bulletin O-75. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1749-K South Second Street, St. Louis 4, Mo.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

PROPERTIES OF PYDRAUL F-9

Appearance	Clear, oily liquid
Color	Light amber (APHA 350)
Specific Gravity	1.266
Weight per Gallon	10.56
Acidity (mg. KOH/gm.)	Less than 0.1
Odor	Mild, pleasant
Pour Point	+5° F.
Hydrolysis Stability	Neut. No. less than 0.1 before and after hydrolysis
Autogenous Ignition Point	Above 1100° F.
Viscosity at 100° F.	49.5—58.0 Centistokes 229—269 S. U. S.
at 210° F.	5.6—6.0 Centistokes 44.5—45.8 S. U. S.

Pydraul: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS—PLASTICS

Serving Industry...Which Serves Mankind

For further information circle No. 53 on the Reader Service Card

Navy Corsair chars Communist position in Korea with Napalm (jellied gasoline) bomb in answer to Marine infantry's call for tactical air support.

U. S. M. C. photo

Fuze parts for Napalm bombs like the one here shown blasting enemy forces in Korea must function with absolute dependability. Fuze parts to meet such exact standards are die cast by Precision, along with hundreds of other items vital to the nation's defense effort. Whatever *your* defense production problem, Precision will solve it with a precisely accurate, lighter, stronger, low-cost die casting . . . a *Precision* die casting.

Call a PRECISION Engineer, Today!

*Since 1909 the name "PRECISION" has been the symbol of highest quality in the die casting industry

PRECISION CASTINGS CO., Inc.
212 Walnut St., Fayetteville, N. Y.
Syracuse, N. Y. · Cleveland, O. · Kalamazoo, Mich. · Chicago, Ill.
British Affiliation — Wolverhampton Die Casting Co., Wolverhampton, England

For further information circle No. 62 on the Reader Service Card.

Looks like a tank . . .

BUT IT HELPS DRIVE A TRUCK

Vari-Speed Governor . . Die Cast by HOOVER

Here's another long and successful application of Hoover aluminum die castings.

It's technically known as a "die cast flange" for the Handy Universal Governor, manufactured by King-Seeley Corporation, for trucks and buses. It is more widely used than all other types of automatic combines.

Countless companies have found that Hoover die castings can save production and assembly time . . . can actually save money on product cost . . . and help turn out a better-looking, more efficient product.

There seems to be no limit to the scope of Hoover die castings now being produced for literally scores of different kinds of things. Hoover is long experienced, and is thoroughly equipped to answer every type of die casting problem on aluminum and zinc.

Look into Hoover die castings for your product now —just ask a Hoover sales engineer to call.

THE HOOVER COMPANY, Die Castings Division, North Canton, Ohio

HOOVER

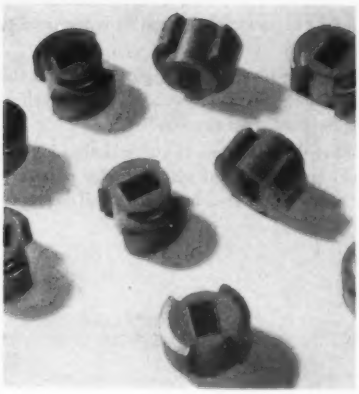
Specialists in the field of die castings

For further information circle No. 33 on the Reader Service Card

COSTS FIGURED IN MILS-PER-GROSS:

2 stampings replaced by *Powder Metallurgy*

By J. T. MAYER
Plant Manager
Stewart Hartshorn Co.



THE roller-type window shade is one of the most commonplace and widely accepted household devices on the market.

It is produced in enormous volume, sold for a low price and does its job so efficiently that few people are aware of the design and detail work which go into this simple-appearing product.

There is actually as much mechanical design involved in a spring-actuated window shade as there is in many electrical appliances. And since volume is high and profit margin narrow, production costs and savings have to be reckoned in mils rather than pennies.

When a home owner buys a window shade, he expects that it will do its job indefinitely without wearing out, he expects that he will never need to repair its mechanism and he expects that its operation will not be affected in any way by customary abuse such as releasing the spring suddenly with a snap. Aside from an occasional wiping or replacement of the shade itself when it has become greasy or dirty, he dismisses the subject from his mind.

To be able to make a window shade that fulfills these expectations, and still to sell it at dime store prices, has sharply limited the choice of materials and methods used in manufacturing, with the result that for many years, there has been no change in construction. Laboratory tests proved that the life of a spring driven roller was 25 years, and that was considered ample.

However, within the past two years, thought has been given to improving the roller action and prolonging its life, even beyond the 25 year expectancy. An effort has been made at the same time to slice a little off production costs.

The Stewart Hartshorn Company, who hold the original design patents on spring shade rollers, have found that if the small hub of the head assembly on the roller is produced from a powdered iron-copper blend, it will perform better, wear longer and cost less than the two stampings which originally were assembled to build the hub.

The head assembly, which serves as a sort of coupling between the drive spring and the roller, is held from

100 percent increase in bearing surface

rotating by means of two pawls which move by gravity to engage either of two recesses in a central hub.

The hub, mounted on the central "spear", can be seen below. Two of these assemblies are shown, one with the two-piece stamped hub and the other with a powdered metal hub.

The hub acts not only as a detent for the pawls, but provides a bearing surface against which the sheet metal end piece rotates. It is obvious that bearing wear occurs mainly along the axis, but since it was impossible to form a neck on the hub when stampings were used, all bearing action took place between the vertical face of the hub and the flat surface of the end piece.

Now, the molding process permits the introduction of a neck or shank on the hub, and thus the bearing surface has been increased by about 100 percent. This has been done along the axis, where the greatest wear occurs, and hence where the greatest need for bearing surface exists.

The iron-copper hub is produced as a porous part and is impregnated with oil. This makes it a self-lubricating part for the life of the roller.

Previously, when the hub was stamped, lubrication was a problem. When oil was applied to the hub, it tended to spread out onto the pawls and created a film which picked up dust and lint. Eventually this caused the pawls to stick and become inoperative. Now, the oil film on the hub is confined to its own surfaces.

A simple test of twirling the head assembly in one's fingers demonstrates the greater freedom of motion which the new powdered metal hub provides.

The company has installed a 12-station rotary press because of the high volume of parts needed, ranging from a million upward per month. An important consideration in figuring costs originally was the volume of parts needed in order to gain the lower shipping rates from buying powder in carload lots.

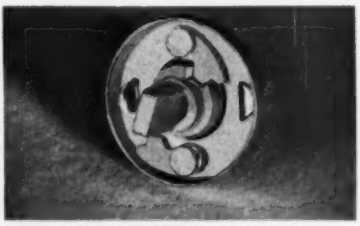
Assembly time of the head assembly has been reduced by means of the hub which replaces two stampings. Since the hub is assembled manually, this represents an appreciable saving. Of course, as has been pointed out, savings are computed in mils per gross, and thus even the slightest improvement in assembly methods is reflected in worthwhile savings.

The powdered metal hubs are formed to very close tolerances, both with regard to those dimensions formed by the die and those between the punches. The presses are double-acting, and are able to hold some impressive dimensional limits, despite the high speed of output.

The drawing, above, will illustrate the dimensions and tolerances which are in the order of ± .002 or ± .005. The rectangular through-hole in the center of the hub needs close dimensions because the spear is pressed in, and a close metal-to-metal fit is required to prevent sloppiness.

Hubs are produced in eight sizes to fit the various wood and metal rollers. Each variation in roller diameter calls for a different size hub.

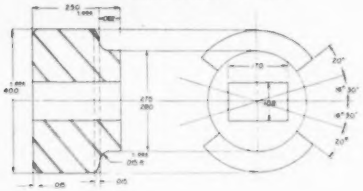
Other developments in roller design involving additional applications of metal powder parts are now on the boards, and at a later date, will be reported.



OLD HUB — 2 STAMPINGS

NEW HUB — 1 POWDER PART

TOLERANCE ON DECIMAL DIMENSIONS ± .002



DIMENSIONS HELD CLOSE ON POWDER METAL ROLLER HUB

1. THIRTY PERCENT LOSS OF METAL in chips resulted when this valve was originally produced by machining sand cast bronze. Now that it is die cast in zinc, approximately five per cent of the metal is removed by machining, thus saving material, time and labor.

POROSITY PROBLEM REDUCED because less machining is needed when *Die Casting*

AN APPLICATION of die casting to a product can usually suggest other similar applications to the designer. This was the case with the Valvair Corp. of Akron, Ohio.

The first application of die castings by this company was the body for a small knob-operated air valve. The valve, which can also be used for water and oil control, is made in 2-way and 3-way models in ¼ inch and ⅜ inch sizes.

Originally, this valve was cast in a bronze alloy and machined to shape. Manufacturing costs have been lowered considerably on this product since the change to die cast zinc alloy, principally because of the lowered cost of the material and the reduction in machining.

As much as 30 percent of the material in the bronze body was machined away in order to finish the piece. Even further losses were sustained because this heavy machining often exposed porous areas, a condition which cannot be tolerated in hydraulic equipment.

Machining the die casting removes only 5 percent of the material, and rejects for porosity have been at a minimum. In addition, coring and the better machining properties of the zinc alloy have not only reduced the machining, but simplified that which remained.

Machining on the bronze casting included rough cuts, finish cuts, honing and drilling of the ports. The die

continued on page 83

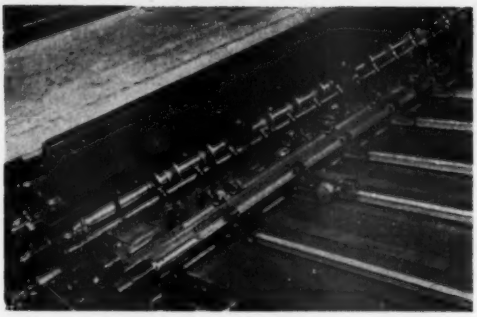


Figure 1. Control of color register is held within .001 on this large Harris offset press.

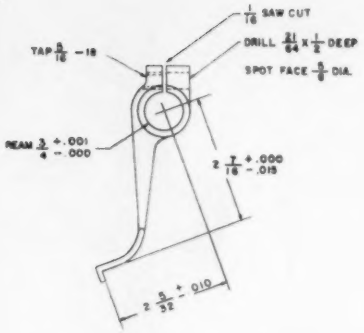
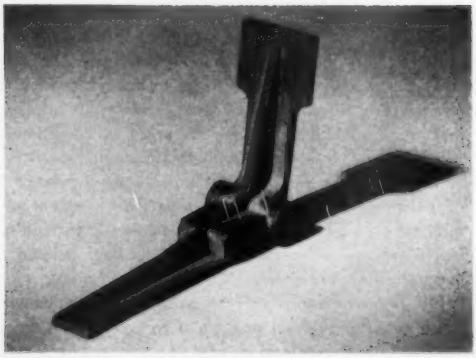


Fig. 2 & 3. Correct alignment to within 0.001 is the function of the stop fingers. The result, proper color register on every sheet. Investment castings are doing this job better and cheaper than drop forgings.



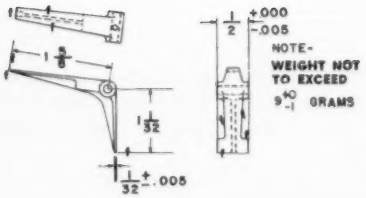


Fig. 4 & 5. Feeling the pulse of a high speed off-set press is the job of the detector fingers. Any malfunctioning of the paper feed is detected by the fingers and the cylinders of the press opened. Costly time loss due to shut downs for cleaning is thus prevented.

IMPROVED BALANCE OF PARTS results from close control of weight by *Investment Casting*

By VICTOR YINGLING
Chief Draftsman
Harris-Seybold Co.

FROM the time of inception, until the first of a new line of offset presses is ready for the customer, three or more years may have elapsed.

Of the total time, almost one year will have been spent in engineering and design. Each of the thousands of parts, whether for the smallest 17 x 22-inch (sheet-size) single color press or the mammoth 52 x 76-inch four color press, is carefully evaluated and examined. Timing and the precise location of the paper are of prime importance so that the finished print has all of its component colors in proper register.

The offset press, Figure 1, in contrast to the direct printing press, uses a thin metal plate on one cylinder to which the ink is applied. This cylinder in turn applies the ink to a rubber covered cylinder. The rubber or "offset" cylinder then transfers the ink to the paper which is being gripped by a third (impression) cylinder.

In order to register the colors properly, the paper must be fed to the impression cylinder in precise alignment, in fact, shift in any direction should be less than 0.001 for good work. Further, if for any reason the feed of paper should be interrupted, the cylinders on the press must be opened to prevent printing on the impression cylinder and later on the back of the paper.

The control of dimensional accuracy of paper alignment and feed paper are helped on the Harris offset presses by investment castings.

From drop forging to investment casting

The stop finger shown in Figures 2 and 3 is used to help align the sheet of paper just before it enters the printing cylinders. From two to sixteen fingers are used per press depending on the size. As the paper moves forward, it strikes these fingers and its position is adjusted so that the leading edge is parallel to the axis of the printing cylinders.

This part was formerly a drop forging which was subsequently machined. There are a few very precise tolerances on it. The bore of the mounting hole is held within + .001-.000 and the distance between the center of the mounting hole and the edge of the finger is held to 0.015. In addition, all parts of the finger that come in contact with the paper must be polished.

With a drop forging, a minimum of ten machining operations were necessary to finish the part. An investment casting made by Midwest Precision Casting Co. requires only five operations to finish it. The investment casting shows a further advantage in that the finished parts are of a more uniform weight. With a single shaft carrying 16 of these fingers and making 7000 oscillations per hour, any unbalance due to difference in weight of the fingers puts an unnecessary strain on the machine.

For this part then, substitution of an investment casting for a drop forging has shown a worthwhile cost reduction and has aided in securing smoother, better balanced operation of the press.

Uniform weight is obtained with SAE 8515 steel

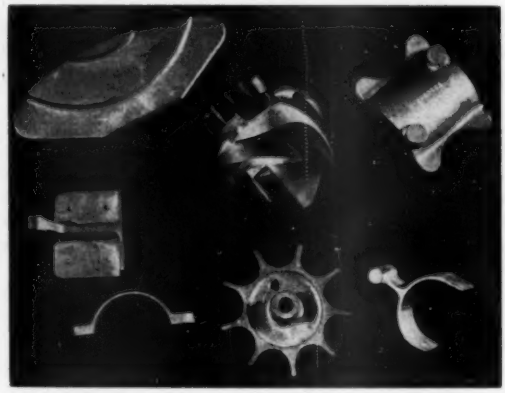
When an offset press misses a sheet, the print will go onto the impression cylinder and, on the following sheet, print on both sides. To prevent this, Harris-Seybold utilizes a throw-out device which automatically separates the cylinders. This throw-out device is actuated by a sheet detector finger. As long as sheets reach the finger at the proper time, the cylinders are held at the proper spacing for printing. Should the feed skip a sheet, the sheet detector separates the cylinders, thus preventing time loss due to shutdowns and cleaning and paper loss.

The present sheet detector finger used by Harris-Seybold is an investment casting of SAE 8515 steel made by the Midwest Precision Casting Co. This finger is shown in Figures 4 and 5. Reference to Figure 4 shows that the dimensional tolerances are

continued on page 103

SPECIAL ALLOY OF ALUMINUM includes zinc to produce dense, uniform castings. Photo courtesy Atlantic Casting & Engineering Co.

RESISTANCE TO SEA WATER CORROSION is a property of manganese bronze castings such as these gears. Photo courtesy Universal Castings Corp.



STRENGTH AND DUCTILITY at elevated temperature are characteristics of aluminum bronze alloy. Photo courtesy Atlantic Casting & Engineering Co.

WIDE RANGE

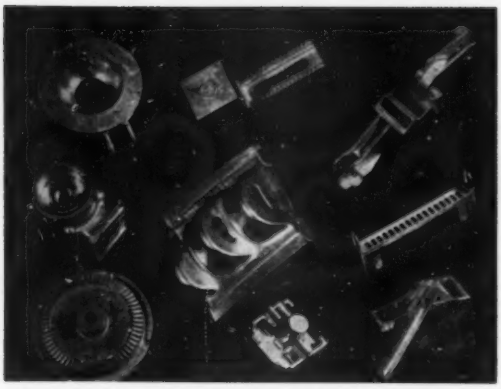
CASTINGS produced in plaster molds are being used successfully in a wide range of products where non-ferrous alloys of high strength, close dimension, superior corrosion resistance or other special properties are needed.

Several processes have been developed for casting pieces in plaster molds on a production basis. One of these now being utilized extensively is the Capaco process'. The special characteristics and features of this process are presented here. In future issues of PMM, the characteristics of other plaster mold casting techniques will be discussed.

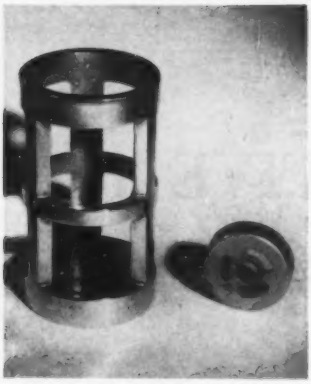
Since it is impossible to cover the numerous phases of the Capaco process in a brief article, attention will be concentrated on the salient points of the standard cope and drag system.

The standard plaster-molds are made in cope and drag sections. Because they, as well as the cores, are made of plaster that is practically inert and thoroughly dried, no gases are formed and there is no ebullition of liquid metal when it flows into place. The molds are self-venting and, therefore, no artificial vents are required. The insulating properties of the mold with respect to copper base alloys produce castings with superior grain structures. Localization stresses are very low because the yielding character of the plaster permits the castings to contract to a practically stress-free state. Hard spots, sand-inclusions and blow holes are eliminated.

Costs of plaster mold castings as compared with ordinary sand castings machined to the same tolerances, are surprisingly low. Another factor, probably of even greater importance to the designer, is the ability to produce parts that are impossible or highly expensive by other means. For instance:



CLEAN, BRIGHT SURFACE that can be polished and plated readily is obtained on yellow brass. Photo courtesy Atlantic Casting & Engineering Co.



IN CONTACT WITH FOOD, nickel silver makes a suitable alloy castable in plaster molds. Photo courtesy Universal Castings Corp.

OF NON-FERROUS ALLOYS can be fabricated by *Plaster Mold Casting*

• No particular problems are encountered in producing castings having thin walls, blind gear teeth, tapering sections, inserts, or transverse passages of varying cross-sectional areas even where the cross-sectional area of the passage at the interior of the casting is larger than the cross-sectional area of the passage at the exterior of the casting;

• Self-rivets can very often be cast integrally;

• Markings, letters and numbers, either raised or depressed, are easily reproduced.

Designers who are familiar with this process have often not only improved their designs but also have reduced costs by combining into one casting many pieces that formerly had been assembled.

Patterns are made in split-style, each portion being mounted on precision ground unit strips. Because many different patterns can be combined in the same mold, the customer does not have to buy a full flask of patterns unless he uses a special alloy or his volume requires it. Flask sizes have been standardized for efficiency reasons.

The life of patterns is practically unlimited inasmuch as they are not subjected to abrasive mold materials, impact, high temperatures or molten metal. If changes in design are required by the customer, it is usually unnecessary to make new patterns because in most cases the alterations can be economically effected in the originals.

Undercuts and complicated castings are readily produced by the use of loose, plaster cores that are easily washed out of the castings.

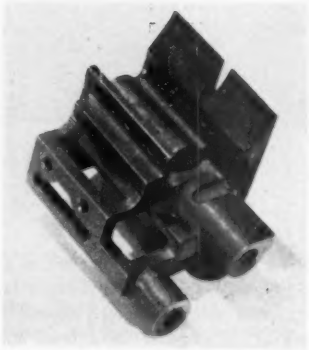
Capaco castings run uniformly to ordinary machine tolerances with limits, depending upon size and design,

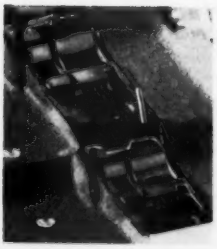
continued on page 88

FIVE PROBLEM PIECES produced by *Investment Casting* and *Die Casting*

Commercial Controls Corporation builds a large variety of special machines for business: automatic typewriters, check endorsers, automatic composing machines, stamp vendors, and a complete line of mailing room equipment.

A few components for these machines which presented difficult production problems are described below, together with the solutions.





INVESTMENT CAST PUNCH BLOCK USED IN TAPE MECHANISM

Beryllium copper investment casting saves 15 milling operations.

An extremely complex little piece used on both the Flexowriter and Justowriter is this punch block. The Flexowriter is an automatic typewriter which operates from a perforated tape made on the same machine, and the Justowriter is an automatic justifying machine working on the same principle.

To produce this small punch block through which a series of small pins move up and down as the perforated tape moves across it, a rough sand casting was originally tried.

A total of 20 milling operations were needed. Problems of accuracy and cost made this impractical. However, when investment casters were consulted, they rejected the piece as being uncastable.

By reducing section thicknesses to avoid shrinkage inaccuracies, at the recommendation of the investment caster, the company has been able to obtain punch blocks close enough to finish dimensions that only five light milling operations were needed.

All investment castings described here are produced by Arwood Precision Casting Corp.

Close accuracy and small diameter required makes it necessary to drill rather than core all holes. The alloy chosen for the part is beryllium copper because of its high fluidity when molten which helps in casting, and its excellent wearing qualities.

Type bar with integral rack is formed by die casting zinc onto steel strip.

In each Ticketograph machine, 60 type bars are required. The Ticketograph is a production control system and job pay record widely used, especially in the clothing industry.

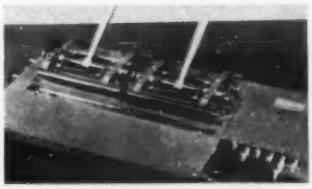
These type bars are moved forward or backward by means of a rack on the lower side to line up figures across a wide span. Obviously, the distance between the teeth of the rack and the numerals on the opposite edge of the thin strip, needs to be accurately controlled, otherwise the numerals wouldn't line up properly.

Another problem was to obtain numerals with thin enough edges to give a clean, sharp imprint.

Originally, these type bars were die cast in one piece, with rack teeth at one edge and numerals at the other. Due to the problem of injecting metal through a long strip about ⅛ inch thick, difficulty was encountered due to shrinkage and warping. In addition, it became necessary to use heavier numerals than desired in order to be certain the die would fill.

The solution of the problem has been to die cast the numerals along the edge of a punched strip of mild steel. The steel strip is placed in the die and the metal cast accurately into position. Small detents along the edge of the strip serve to key the die cast metal.

Now it is possible to control the relationship between numerals and gear teeth, and the width of the numerals has been reduced from .007 to .002 for better imprinting.



DIE CAST NUMERAL STRIP
ON PUNCHED STEEL RACK

Whereas it was sometimes necessary to straighten the long, die cast strips, that has been eliminated now. Cost of the piece with steel insert is somewhat lower than before.

Although the majority of the company's many die cast parts are still obtained from contract die casting firms, this type bar is now produced in the plant on a small machine purchased for this purpose.

Difficult surface detail obtained in stainless steel investment castings.

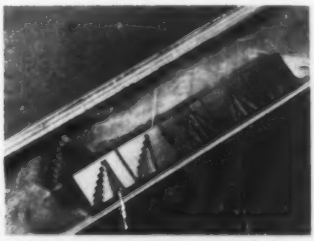
Any attempt to machine the computer bars from the solid, even using a duplicator, would be extremely difficult. These parts of the Flexowriter and Justowriter machines, investment cast in stainless steel, presented a real problem.

The pattern of small recesses on the surface must be held to close tolerances because they control the process of "justifying" the type, or expanding it to make all lines of even length. Stainless steel is needed for its hardness and wearing characteristics.

Originally, this piece which extends for a length of five inches, was produced in two halves, each 2¼ inches long, when the investment caster said that it would be impossible to hold tolerances across the full length.

This failed, and the solution was to divide the bar

continued on page 85



INTRICATE DETAIL IN STAINLESS STEEL
BY INVESTMENT CASTINGS FOR THESE
COMPUTER BARS

SAFETY COMMITTEE HONORED

by Award of American Die Casting Institute; Annual meeting hears metal situation discussed

DRESS SANFORD VAN HORN

IN AN INDUSTRY which includes a number of potential safety hazards in its normal course of operation, the introduction of a manual to serve as a guide for safety practices represents a major step in the advancement of the industry.

This judgement is expressed in the presentation of the annual Doehler Award of the American Die Casting Institute to the three-man committee which drew up and published the Institute's Safety Manual.

The Doehler Award, established in 1949, is made each year "for the outstanding achievement contributing to the advancement of the die casting industry." Naming of the award winners was a climax of the annual meeting of the ADCI in Chicago September 18 and 19.

Recipients of the award for 1951 are: Charles A. Sanford, industrial relations manager, Cleveland Hardware and Forging Co.; Norman Dress, personnel manager, Precision Castings, Inc.; and Byron S. Van Horn, safety director, Doehler-Jarvis Corp.

More than two years of work went into the Safety Manual which was published early this year. It represents a compilation of the best safety practices from a large group of die casting plants throughout the country, and includes all phases of die casting plant operation and maintenance.

This manual is designed for use by either large or small plants, and contains recommended methods of controlling accidents. It represents a compilation of actual current practice, rather than theoretical recommendations.

The Doehler Award was presented by Austin T. Lillegren, president of the Institute and a vice president of Madison-Kipp Corp. The award includes a certificate and cash awards of $500 to each of the three winners.

In 1950, the award went to C. R. Maxon of the New Jersey Zinc Company for his work in gaining acceptance for zinc alloy die castings by the U.S. Army Engineers in Canal Zone.

PRICE CEILINGS AND REGULATIONS ARE PRESENTED AT ADCI MEETINGS

At business and technical sessions, Institute members heard discussions of governmental price ceilings and regulations, were given a review of the metal supply

LAINE SCHROEDER SANFORD

PACK VANDERHOOF

situation, took part in a safety panel, and heard a paper by Maurice-Caldwell of the Doehler-Jarvis Corp. on "The Effects of Corrosion on Plated Die Castings."

Robert Benes and Edward Metzger of the Castings Section, Metals Branch, OPS, discussed price ceiling procedures to be used by die casters and clarified provisions of CRP 60. Erwin Vogelsang and N. W. Bell of NPA discussed the metal supply situation, touching on both current supplies and slab zinc allocation. Aluminum ingot and secondary aluminum prospects were also covered.

Austin Lillegren of the Madison-Kipp Corp. was re-elected president and G. M. Rollason of the Aluminum Co. of America was re-elected vice president. The board of directors for the coming year is: Arthur G. Chase, Precision Castings Co., Inc.; Thomas J. Walker, Mt. Vernon Die Casting Co.; G. M. Rallason, Aluminum Co. of America; H. H. Weiss, Superior Die Casting Company; George Ralls, Pressure Castings, Inc.; R. A. Luedtke, Schultz Die Casting Co.; Austin Lillegren, Madison-Kipp Corp.; Fred Schroeder, Milwaukee Die Casting Co.

Also Charles G. Adams, Twin City Die Casting Co.; A. W. Simpson, III, Western Die Casting Co.; J. M. Davis, Union Die Casting Co.; Paul Berndt, Harvill Corp.; A. J. Sanford - ex officio, Cleveland Hardware and Forging Co.

LILLEGREN ROLLASON WEISS

CHASE DAVIS SIMPSON

PREFERRED LIST OF DIMENSIONS FOR SINTERED BEARINGS ARE SET UP BY METAL POWDER ASSOCIATION

Two new standards designed to aid both the metal powder producing and consuming industries as well as the metal powder parts user have just been released by the Metal Powder Association. One of the standards specifies the preferred dimensions and tolerances of oil impregnated metal powder bearings, better known as self-lubricating bearings. The second standard describes a method for determining the green strength of compacted metal powders.

Bearings made from sintered metal powders and impregnated with oil to make them self-lubricating have gained wide acceptance as a preferred bearing material. Universal acceptance, however, has brought with it the inherent problem of establishing a list of preferred bearing sizes and their dimensional specifications.

In an effort to aid both the producer and consumer of such bearings, the M.P.A. prepared a standard designated 14-5IT which lists and specifies the dimensions and dimensional tolerances of sintered metal powder oil impregnated bearings of the bronze base and iron base type. Identifying designations have been applied to each standard size bearing.

This standard should contribute much toward eliminating the design engineer's problems when faced with too many bearing sizes from which to choose. Furthermore, it should reduce overhead and similar expenses as well as help conserve strategic metals by cutting down on the huge inventories and stocks of odd-sized bearings that must now be maintained by bearing manufacturers and the larger consumers.

Tentative for a period of three years, the standard specifies nominal bore, wall thickness, interference, running clearances and press fits. Also given are bearing lengths, material compositions, permissible loads and dimensional tolerances for inside and outside diameters, length and concentricity. The list of preferred bearings begins with 1/8 in. I.D., 3/16 in. O.D., 1/4 in. length and concludes with 3 in. I.D., 3 1/2 in. O.D., 4 in. length.

The other new standard deals with green strength, a vital property peculiar to the powder metallurgy process. The term "green strength" applies to the resistance of a pressed compact to abrasion, breakage and spalling due to rough handling and

continued on page 78

CROSS-REFERENCE DATA SHEET SIMPLIFIES ELECTRONIC CORE DESIGNATION; NEW MPA LIST

A confusing situation has existed for some time in the electronic core industry. Manufacturers of iron powder and other powdered magnetic

continued on page 53

WELDABILITY OF MAGNESIUM PERMANENT MOLD CASTINGS

makes improved modern dockboards possible

By V. J. DANIELS
Manager, Engineering Division
Magnesium Company of America

AN important product of our company is the magnesium dockboard for industrial use. A dockboard is used as a bridge between a dock and a freight car or truck. Before the advent of the Magcoa dockboard, thick steel plates were used for this purpose. Such steel plates were heavy, cumbersome to handle and presented a very definite safety hazard. Frequently the plates were incapable of withstanding heavy loads without buckling, causing accidents to personnel and damage to material and equipment. They also were extremely difficult to secure properly. Furthermore, their excessive weight made them impossible to handle quickly and efficiently. Magnesium Company of America designed magnesium dockboards to solve these problems.

A Magcoa dockboard is a custom-designed and custom-built bridge made for each specific application. Being made entirely of magnesium, it weighs 1/3 to ¼ as much as steel plates of comparable strength. Its light weight speeds up operations in which it is used, reduces handling accidents, cuts down on worker fatigue, and generally lowers cost of handling materials. These dockboards will not slip out of position.

Curbs along its sides prevent runoff of loading equipment. Being rounded, these curbs give maximum clearance for loading equipment and prevent damage to tires.

Magnesium permanent mold castings are welded to the deckplate

Each dockboard has three major components: The deckplate, the under frame, and the guard rails or safety curbs. Magcoa dockboards are assembled by welding. At the ends of each of the guard rails a tapered end casting is welded. The Heliarc or inert gas shielding process is used. By this method an inert gas, usually argon, protects the arc from the air and eliminates the forming of oxide in the weld. Magnesium welding rods are used.

In the early development of the dockboard the ends of the guard rails were sawed to a curved shape. Small pieces of plate were then cut, formed, fitted, and welded into place to produce a rounded or tapered end. The rounding or tapering of the ends of the guard rails was necessary to provide the maximum turning radius at points of entry and egress from the board, to reduce damage to tires of vehicles driven across the board, and to prevent injury to pedestrians who might accidentally scuff a foot against the board in walking by.

Fabricating the ends of the guard rails in the manner described was costly, time consuming, and resulted in an unattractive appearance. It was apparent that this portion of the dockboards should be redesigned.

It was determined that in the modification of the guard rail ends the following considerations were important:

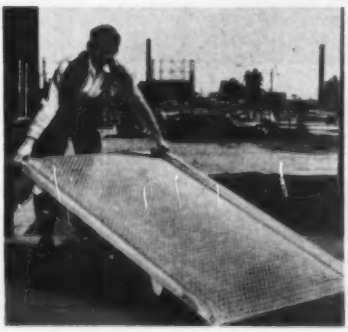
1. The end section must conform accurately to the shape of the guard rail so that upon assembly a smooth continuous surface with no irregularities would exist.
2. It must taper smoothly to almost a point at the end of the rail.
3. Assembly must be by welding.
4. The surface of the end section must conform in appearance (smoothness) as closely as possible to the extrusions and plate of which the dockboard is made.

SINCE WELDING IS USED to assemble other parts of the magnesium dock board, it was necessary that the castings used for the end pieces should be weldable for practical reasons. The magnesium permanent mold castings are shown above being welded onto the deckplate.

5. The end sections which are subject to the maximum amount of abrasions and wear must be rugged and thick to withstand the severe abuse of vehicular traffic bumping the ends of the guard rails.
6. Hand holds must be incorporated to permit easy portability of the board.
7. Provision must be made to prevent water from finding its way beneath the guard rails, which would cause a corrosion problem.
8. The fabrication method should exhibit maximum economies consistent with the large number of dockboards being made.
9. The end section should be fabricated in one piece, if possible.
10. The end piece should be pre-bevelled in all welding areas to avoid the costly bevelling of guard rail ends and deckplate.
11. The trademark "MAGCOA" should be incorporated into the end of the guard rail for appearance and identification purposes.

Based upon these prerequisites a design for the end pieces was developed. It was apparent that the considerations listed above could be achieved best by making

OLD ◆ ◆ NEW



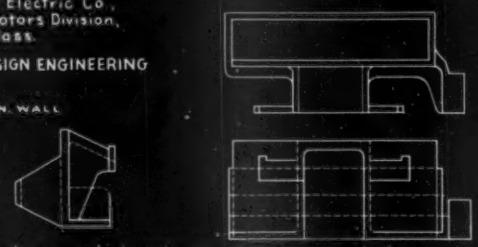
WANTED: closer tolerances reduced costs

SUGGESTED - BRUSH HOLDER

General Electric Co.,
Small Motors Division,
Lynn, Mass.

Att: DESIGN ENGINEERING

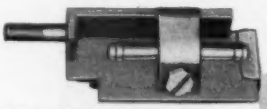
.076 MIN. WALL



This design is the best from production standpoint
We could produce it to reflect credit
on both companies E. B. Atlantic Casting

The production of a light weight, rugged brush holder for use with aircraft generators posed a problem for General Electric. They wanted a high-quality, rigid brush holder at reduced cost, produced by a process that afforded closer control of tolerances.

Atlantic was consulted and the recommendations they made on the brush holder design provided more than ample strength. The Atlantalloy process provided the close tolerances and lower cost.



Old brush holder designed by General Electric for use on aircraft generators.

New brush holder designed in collaboration with Atlantic engineers and produced by the Plaster Mold Process.

WRITE for a copy of "Quality Precision Castings for Industry" on your Company letterhead. This booklet explains how the plaster mold process cuts production costs, and includes specifications on Atlantic's alloys.

CASTING and ENGINEERING CORP.

For further information circle No. 17 on the Reader Service Card

the end of the guard rail as a casting. Such a casting would conform accurately to the contour of the guard rail and taper smoothly to a point. Section thicknesses could be made as heavy as necessary.

It was easy to incorporate a hand hold cast into the piece and to design away from problems caused by water entrapment. Bevels could be incorporated without machining and the trademark could be cast into the part.

The next consideration was the casting method to be used. The smooth surface and accuracy desired indicated either permanent mold casting

SIX DIFFERENT CASTINGS, right and left in three sizes, are cast in three molds.

or die casting. Since it also was desired to cast the part as reasonably as possible, considering the quantities involved, sand casting was out of the question.

Further analysis of our problem led to the conclusion that permanent mold castings should be used. We were able to obtain these parts as permanent mold castings of substantial thickness (as thick as 7/8") without encountering porosity. It was necessary that the castings be free of internal porosity for welding reasons as well as strength. Tooling cost in permanent mold was less than for die cast tools.

Six end castings are used. There are three sizes, right and left of each size. Three molds were built, one for each of the sizes required. Each mold contains two cavities, one each for right hand and left hand end castings.

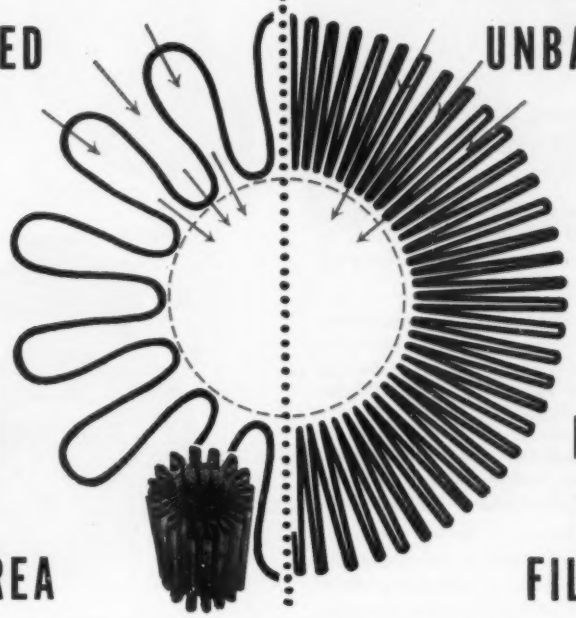
The castings are made in the newly-recommended alloy, AZ91C, and are used in the as cast condition. This alloy has the favorable characteristics of toughness, high castability, and weldability.

By using permanent mold cast magnesium end pieces we were able to produce a functionally better dockboard with improved appearance at reduced cost.

ACTIVE FILTER AREA VS TOTAL FILTER AREA

BALANCED

UNBALANCED



FOR MAXIMUM ACTIVE FILTER AREA

BY EXCESSIVE INACTIVE FILTER AREA

LIQUID MUST GET THROUGH TO BE USEFUL!

Elemental, but sometimes forgotten in attempts to pack too much filter mesh into a unit. Liquid entering the outer circumference of the diagrammed corrugated mesh can't be used until it passes out through the inner circumference indicated by the dotted red circle. Marvel engineers have determined scientifically the number of properly proportioned synclinal folds needed to provide the limit of useful ACTIVE mesh area to filter all the liquid that can pass through this outlet space. Crowding more folds of mesh into the same space only increases INACTIVE mesh area; the exit space is the same, can't pass an ounce more a minute. In fact, useless wire mesh obstructing the passage causes even less liquid to pass through. Enough tightly packed folds of excess mesh could cut the flow to a trickle. Balance between mesh openings area and outlet area is imperative for maximum flow rates at minimum pressure loss.

Sump Type (cutaway)

Line Type (cutaway)

STORAGE CAPACITY for FILTERED OUT MATERIAL

Folds of mesh crowded so closely together that they almost touch do not allow enough space between them for accumulatd foreign matter. A moderate amount of filtered out material soon fills up all space between folds and reduces operation to filtering at the outer ends only. Well spaced, properly balanced MARVEL SYNCLINAL corrugations leave plenty of space for foreign matter storage without flow interference or pressure build up. Obviously, a filter lacking such space for accumulated material will require more frequent attention.

FOR ALL HYDRAULIC & LOW PRESSURE SYSTEMS wherein non-corrosive liquids are filtered. Available in capacities of 5 to 100 g.p.m. and in mesh sizes from 30 to 200. Multiple installation permits greater capacities. Simplify your preventive maintenance with Marvel Synclinal Filters.

CHOICE OF OVER 240* ORIGINAL EQUIPMENT MANUFACTURERS

*As of August 1, 1951

For complete engineering data on both sump and line type filters

Write for Folder 105

Meets J.I.C. Standards

MARVEL ENGINEERING COMPANY

625 W. Jackson Blvd. Chicago 6, Ill.

For further information circle No. 43 on the Reader Service Card

INTERCHANGEABILITY AND LOW COST

in combination lock parts

By ARTHUR ABELSON
Chief Engineer
Sargent & Greenleaf, Inc.

UNLIKE most other designers who are concerned only with problems of normal wear and tear, the designer of locks is also up against the deliberate and skillful manipulations of criminals.

In addition to such risks as abrasion, applied loads, corrosion and aging deterioration—all of which can be reasonably well predicted and countered—the lock designer has to foresee and prevent the most determined efforts of human competitors.

When his locks are to be employed for some critical storage places containing matters relating to national security, there is an additional responsibility upon him to attain infallibility.

How near he achieves this goal is determined both by his mechanical ingenuity and his judgment in choosing materials.

In response to governmental need for a completely dependable lock to be used on filing cabinets, safes and other storage places, Sargent & Greenleaf, Inc., have developed a manipulation-proof combination lock which is now available for commercial and industrial application.

The locks have been approved by Underwriters' Laboratories and are used extensively by government agencies for utmost security. So confident is the company concerning the complete protection provided by these manipulation-proof combination locks that it has placed a 25-year guarantee on them and posted a large reward for anyone capable of opening the lock without prior knowledge of the combination.

The body, dial and cover for these locks are zinc alloy die castings, as are many important lock components throughout our line. The highly critical manganese bronze lever which provides positive protection against unauthorized manipulation is a plaster mold casting.

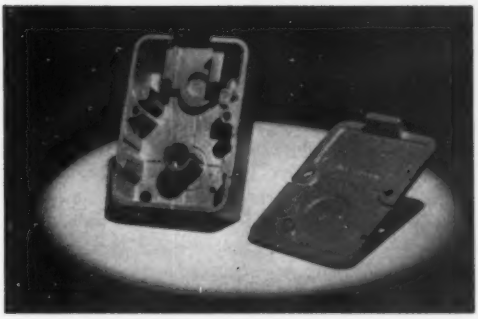
As can be imagined, these materials have been subjected to the closest study to ascertain that they will furnish the required physical characteristics.

SECURITY comes from the right selection of materials, as well as from ingenious mechanical design in this manipulation-proof combination lock.

Although Sargent & Greenleaf has its own extensive fabricating facilities, including a complete sand foundry along with its stamping and machining departments, it has been found more economical to purchase these die castings and plaster mold castings from outside sources.

It might be thought that when protection against theft is concerned, cost would be a minor consideration.

Die Casting, Plaster Mold Casting.



COMPLETE UNIFORMITY of these five die cast zinc parts permits a stepped-up production line. Wide choice of plated and painted finishes is available in the Sargent & Greenleaf plant.

This is not the case, and it is as important for the designer to hold his costs to a minimum as it is for him to provide the maximum in protection.

This dilemma is not uncommon in industries where large quantities of parts are being fabricated, and our solution has been to utilize die cast parts wherever possible for major housings and functioning parts where the physical properties of die cast zinc would meet the requirements.

The old-fashioned file-and-fit approach to lock-making is definitely a thing of the past, and Sargent & Greenleaf locks depend upon die cast parts for complete uniformity and interchangeability. This has reduced assembly time and secondary operations to an absolute minimum. It would be entirely impossible to produce a lock such as the new manipulation-proof unit, with all of its detail and close dimensions, at a competitive price, if die cast housings were not utilized.

Accurate Die Casting Company of Cleveland, Ohio, produces all die castings used in the manipulation-proof combination lock.

The die casting process is, in itself, an economical method of reproducing large numbers of identical parts, but with the advice and cooperation of the die caster, it is often possible to increase substantially the advantages of the process. S & G engineers work in close cooperation with the die caster, with the result that many extra savings have been made.

inserts in die cavity for similar die castings save tooling

For example, wherever possible, inserts in the die cavity are used for changes in detail where two or more parts have basically the same shape. The combination dial, for instance, is produced with many variations: in the arrangement of numbers, in the height of the knob, in the placing of name or insignia on the knob. The same cavity is used for all of these, but with different die inserts, thus saving the major tooling cost. Surface finish is another important consideration. The company has a complete finishing department, equipped to apply plating, organic coatings, chemical treatments and a variety of mechanical finishes.

Die castings are received with a smooth surface which, when buffed to a lustre, takes any of several finishes very readily. All die castings to be painted are first given a phosphate coating for corrosion resistance and good paint adhesion.

The case and cover of the manipulation-proof combination lock are ground together to clean up any

irregularities along the parting line of the castings.

Normal finish consists of bronze plating over copper and nickel underplates, but current metal shortages have necessitated the introduction of organic coatings such as hammered type baked enamel.

The dial itself, subjected to the corrosive effects of grease and perspiration, gets the full copper-nickel underplating before the chrome, brass or bronze final plate. The outer ring of the dial is chrome plated directly over copper without the intermediate nickel, and therefore the piece is treated with a final coating of clear baked lacquer.

Where the combination locks are to be installed in the doors of safes, a special corrosion condition exists, since the insulation material inside the safe door is usually poured wet and solidifies in place. Although this wet material comes into direct contact with the plated or painted die cast surface, no deleterious effects have occurred.

Tensile strength of 95,000 p.s.i. from manganese bronze plaster mold casting

The professional thief has many techniques which have been effective against the conventional combination locks. It is sometimes possible to detect combinations by eye, ear or finger tips; some combination locks can be "inched" even if the exact combination is missed. Stethoscope or electronic listening devices also have been employed.

On the less subtle side, there is the possibility of driving the central spindle through to break the lock, or of smashing the entire locking mechanism to render it inoperative.

All of these possibilities, and every other conceivable trick for gaining unauthorized entry, have been guarded against in the manipulation-proof lock.

One of the central elements in providing absolute security is the manganese bronze lever. This irregularly shaped piece is essential to the working of the lock, for it includes the "fence", a perpendicular projection which slips into the slot in the three wheel tumblers when the correct combination has been dialed. In so doing, it retracts the stainless steel bolt and permits the safe or compartment to be opened.

This critical lever is produced by casting manganese bronze in a plaster mold. The alloy has a tensile strength of 95,000 psi, which assures against failure due to breakage. This casting is produced for Sargent & Greenleaf by the Atlantic Casting and Engineering Company of Clifton, N. J., who specialize in this type of casting.

Smooth, cleanly detailed surfaces, closely controlled dimensions and complex shape are all attained by plaster mold castings.

A projection on the lever rides noislessly on the circumference of the drive wheel, as illustrated in the view of the lock with cover removed. This keeps the "fence" at least .030 away from the wheel tumblers,

continued on page 86

CHOICE OF MANGANESE BRONZE is dictated by the need for great toughness in this lever which is attached to the bolt, and also has the fence (perpendicular projection) which falls into the tumbler slot when all three tumblers are properly aligned.

TAKE ANOTHER LOOK

AT YOUR PRODUCT from these Points of View

1. Cost Reduction
2. Sales Appeal
3. Simplicity With Complex Design
4. Weight Saving
5. Heat Conductivity

Perhaps a DIE CASTING is the ANSWER!

If so, let's talk it over. Thompson Products offers you all these advantages:

1. Die Investment Protection
2. Experience — 25 Years
3. Excellent Physical Equipment
4. Service
5. Quality At Competitive Prices

YES...TAKE ANOTHER LOOK!

A competent representative will call at your request to help you plan any new parts you may need or old ones you wish redesigned.

Thompson Products, Inc.

2249 ASHLAND ROAD • • • CLEVELAND 3, OHIO

LIGHT METALS DIVISION

For further information circle No. 74 on the Reader Service Card

BEHIND THE SCENES: a presentation of some steps in the production of investment castings

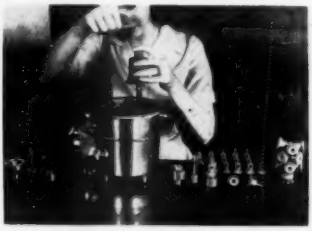
The product designer who is familiar with the various phases of fabricating methods employed to produce parts which he designs, has a background which will assist him in his job.

Familiarity with fabricating processes permits the designer to visualize the successive steps through which the components pass starting with preliminary layout and tooling and culminating in a raw casting or molding ready for secondary operations.

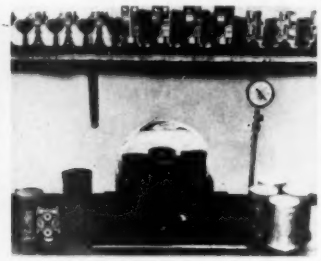
He is thus better able to appreciate the problems involved in achieving dimensional tolerances, he recognizes what can be accomplished with regard to complexity of shape and sectional variation, he recognizes the limitations imposed by shrinkage, ejection, metal flow and the other mechanical phases of the process, and he learns that his designs will be more successful and he will save money by consulting with the fabricator at an early stage of design development.

With this in mind, the editors of PRECISION METAL MOLDING will present regular articles showing various phases of the casting and molding process as practiced on a commercial basis.

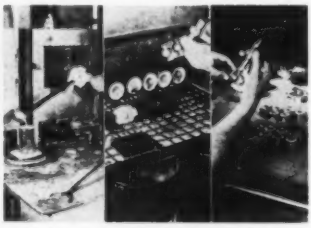
The photographs on these pages were taken at the plant of Precision Metalsmiths, Inc., of Cleveland, Ohio, who have produced small, intricate precision parts by investment casting in more than 125 different alloys.



Mold of gear, **left**, is assembled. Molten wax is injected using a Sta-Warm electric wax melter to form patterns. "Tree" of patterns at **extreme right** shows how patterns are mounted on wax pillars.



"Treed" patterns, **left**, are placed in metal flask. Investment material is poured into flasks and evacuated at 30 psi vacuum.



Rubber bases removed, inverted flasks are baked 12 hours to remove wax, **left**. Hardened metal is knocked out of flask, **center**. Finished trees are inspected, **right**.

1. Making a metal mold or die which can be put together—and taken apart—into which a special molten wax, plastic or other pattern materials at controlled temperatures is injected. The wax hardens and when the die is removed from around it, the wax is a pattern of the desired finished piece, often of intricate design and made to extremely exact tolerances.

2. Small wax patterns are mounted on a "tree" trunk of wax, by hand, facilitating several being cast at a time. The tree is mounted on a rubber disc or base and placed within a flask—a length of steel tubing.

3. Investment—a special plaster-like substance, is poured into the flask and air bubbles withdrawn from the semi-liquid materials by vacuum under a bell jar—the hardening investment settling snugly around each

wax pattern and the tree. Then the rubber base is removed.

4. Flasks containing the hardened investment—and the wax patterns—are inverted in an oven and controlled heat bakes the wax out of the investment, the tree serving as a gate. The wax oxidizes and becomes lost—hence the phrase "lost wax" process. The burned-out mold now represents cavities in the hard investment—cavities of the exact size and shape of the patterns, with a gate cavity leading to them.

5. Molten metal is then poured into the flasks at specified temperature, the flask having been set right side up, of course. After the metal hardens, the outside of the steel-tubing flasks are pounded, the investment breaking from around the now metal parts. A bath is used to dissolve the investment from some castings.

6. A spinning carborundum disc is used to cut the individual metal parts from the tree, which becomes scrap for re-melting.

7. Finishing by hand completes the process, burrs being removed as left from the cutting-off step, with sand and vapor blasting used in some instances. Inspection, of course, follows.

ELECTRONIC CORE LIST
continued from page 43

materials used in electronic cores established proprietary designations for their materials. At the same time, the fabricators of the cores also established different designations for their products depending on the raw material used and the electrical characteristics desired.

As a result, the purchasers and users of electronic cores were faced with the problem of trying to correlate designations of the various companies with the raw materials used and also compare one company's products with that of another.

This confusing and time-consuming problem has now been eliminated. The Metal Powder Association, through its Standards Committee, has just issued "Metal Powder Association Data Sheet No. 1" which cross-references designations of the basic electronic core materials with the corresponding designations of eight of the leading core manufacturers. It is now possible to determine at a glance who makes cores from any of twenty-five different basic materials; what their core designation is; and what corresponding designations are used by other core makers.

M.P.A. Data Sheet No. 1 is available free of charge to all interested parties. Copies may be obtained by writing to the Metal Powder Association, 420 Lexington Ave., New York 17, N.Y. or by circling No. 260 on the Reader Service Card.

DOES YOUR PRODUCT SHY AWAY FROM *Competition?*

Competition is the backbone of American progress. It tends to increase a product's value... to improve its usefulness and its appearance. It also serves as a barometer of consumer preference.

If your product lags behind in sales, investigate the many design, production and economy advantages of Badger die castings.

Our enlarged engineering and production facilities have helped many manufacturers win leadership in their fields.

For further information circle No. 19 on the Reader Service Card

Could you produce this part for 19¢*

This pawl is a vital part of a Bazooka

* in tool steel to maximum tolerances of ±.003"

Casting Engineers, Inc.,
can produce this part for 19c because our method of investment casting permits the use of mass production principles by casting, in this instance, 108 pieces at one time.

Investment Casting
eliminates handling of raw material stock.

Investment Casting
eliminates drill press and operator.

Investment Casting
eliminates milling machine and operator.

Investment Casting
eliminates service failures and spoilage.

Casting Engineers', Inc.
method is resulting in substantial economies in the production of metal parts of all kinds, especially those of intricate design or where materials used make it impossible or costly to machine.

ENGINEERED PRECISION CASTINGS

For a guide to important savings, send today for new booklet "Cost Reductions Through Investment Castings"

CASTING ENGINEERS

INCORPORATED

2323 BOSWORTH AVENUE, CHICAGO 14, ILL.

Meet us at Booth H-324 at the Metals Show
For further information circle No. 21 on the Reader Service Card

RUBBER OR METAL

MOLDS useful for making wax investment casting patterns

WAXES PRODUCED IN RUBBER MOLDS

IN making wax patterns for investment casting, either metal or vulcanized rubber molds can be used, each offering certain advantages. Metal molds undoubtedly predominate in current usage, but for certain types of applications, the rubber molds are preferred.

A recently introduced wax injection machine from Arofine Products, Inc., New York, is adaptable for each type of mold, since it operates on air pressure, hydraulic pressure or a combination of the two.

The three photographs of waxes are examples of pieces from rubber molds. Sharp clean detail is obtained, as illustrated by the internal and external threads on the mating valve fittings. Because of the slight resiliency of the rubber mold, it can be stripped from undercuts such as internal threads. There is some sacrifice of tolerances due to the character of the rubber.

When rubber molds are employed, the Arofine injector is operated on air pressure, but for metal molds, either hydraulic pressure or combination air-hydraulic is used.

continued on page 87

AIR OR HYDRAULIC UNIT

FINISHING SECTION

MACHINING—Most precision metal molded parts require some machining operations. In this section will be found information to aid in planning and selecting the proper methods and equipment for these operations.

ASSEMBLING—Precision metal molded parts are generally components of assemblies. This section includes information on fastenings and methods for mass production assembly operations.

SURFACE FINISHING—Many precision metal molded parts receive some type of surface finish such as plating, organic coating, anodic coating or chemical coating. This section includes information on the methods, processes and equipment used for these surface treatments.

A Section Devoted To the Finishing Of

Die Castings
Investment Castings
Powder Metal Parts
Permanent Mold Castings
Plaster Mold Castings

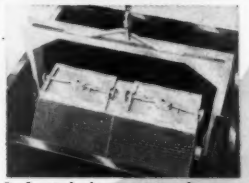
ALMCO

Supersheen PRESENTS

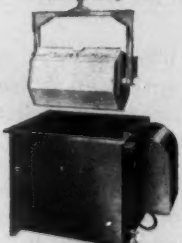
Revolutionary New

SUBMERGED FINISHING BARREL

MODEL SB-10 MAKES POSSIBLE MANY ENTIRELY NEW APPLICATIONS OF ADVANCED BARREL FINISHING



Perforated drum rotates in open tank of liquid—which provides cushioning effect in processing of soft metal parts.



For use alone—or "IN-LINE" for multiple operation processing. Drum easily moved from one tank to another—eliminating need for removal of mass from drum

New-Revolutionary SUBMERGED MASS FINISHING

- FOR LOW MICRO-INCH FINISHES
- FOR UNEXCELLED COLOR
- FOR LARGE AND SOFT METAL PARTS
- FOR CLOSE TOLERANCE PARTS

Now—manufacturers formerly "left out in the cold" by barrel finishing techniques can enjoy the savings—increased production—and better finishes provided by Supersheen's New Submerged Finishing Machine. Model SB-10 does an excellent job of heavy parts and large soft metal parts. The cushioning effect which results from complete immersion of barrel lessens impact between large parts and virtually eliminates nicking and scratching.

The new SB-10 is also outstanding for processing smaller parts requiring utmost in color and micro-finish. Variable speed drive—8 to 30 R.P.M. Write today for full details on new Model SB-10.

ALMCO Supersheen

AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT—MATERIALS AND COMPOUNDS

ALBERT LEA, MINNESOTA

METAL FINISHING INDUSTRIES LOOK TO ADVANCED BARREL FINISHING FOR SOLUTION OF MAN POWER PROBLEM

Manpower shortages and high-cost labor are a few of the major problems that ALMCO Supersheen advanced barrel finishing equipment is solving for manufacturers.

A single unit installation replaces from 2 to 12 men—savings run as much as 95% under former finishing methods. Many manufacturers report that ALMCO Supersheen has paid for itself in less than two months. This CONTROLLED method of barrel finishing pays off handsomely in direct labor savings, increased production and better finishes (TO ALMOST ANY DESIRED MICRO-INCH READING).

BIG NEW ADVANCES MADE IN BARREL FINISHING

ALMCO'S recent development of new barrel finishing techniques and the new super-efficient ALMCO Supersheen abrasive media and compounds now makes it possible for manufacturers in almost all metal-working fields to enjoy the benefits of the ALMCO Supersheen process.

The ALMCO Supersheen process is now used in a multitude of finishing operations—deburring, grinding, cutting down, cleaning, forming uniform micro-exact radii, improving surface finish, reducing surface porosity, finishing threaded and intricate parts, removing paint, coloring, burnishing, etc.

COMPLETE LINE OF EQUIPMENT AND COMPOUNDS

ALMCO Supersheen has the barrel finishing industry's most complete line of equipment. A large variety of barrel sizes are available from 8" x 16" to 30" x 60"—to fit almost any type of barrel finishing job. ALMCO also builds SPECIAL machines for SPECIAL jobs. ALMCO Supersheen has developed a wide range of ADVANCED compounds and abrasives for the many barrel finishing processes. These compounds have been carefully compounded through extensive research especially for barrel finishing—AND NO OTHER PURPOSE! These specially developed compounds play a very large part in achieving the finer finishes and faster processing of the Supersheen process.

FREE SAMPLE PROCESSING

Almco maintains complete sample processing and research facilities. Sample processing is done FREE! We invite your samples and inquiry.

FREE

This inside story of Advanced Barrel Finishing. 20 pages of facts and figures. Write for Booklet No. D-10

MAIL COUPON NOW!

ALMCO Supersheen, Albert Lea, Minn.

☐ Also send copy newest catalog.

NAME _____

ADDRESS _____

CITY _____ STATE _____

For further information circle No. 84 on the Reader Service Card

SOME SUGGESTIONS FOR MACHINING POWDERED METAL PARTS

ONE of the outstanding features of parts made from metal powders is the freedom from machining and the low scrap losses as a result. However, it is very often necessary to do some machining on sintered parts, particularly when there are holes to be drilled or tapped at some angle other than parallel to the direction of applied pressure during forming. Further, some designs call for re-entrant angles or grooves that can not be molded in.

Another case where a considerable amount of machining is required is in experimental work. Cases will arise where the use of powder metal parts may be somewhat questionable and resort is made to machining the piece in question from a block of sintered material of the type that will be used when the design is finalized.

Many design engineers and machinists have the false impression that powder parts cannot be machined satisfactorily. Like any other material, *sintered metal can be machined if the proper tools, correctly shaped are used.*

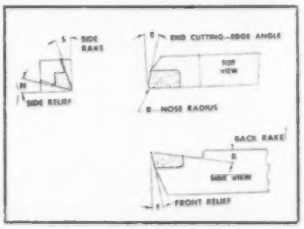
Like cast metals, particularly cast iron, molded metal parts when machined give fine chips rather than shavings. The metal tends to be somewhat abrasive and with ordinary steel machine tools has a definite abrasive action. For these reasons, either diamond tipped or carbide tools should be used, for example No. 883 Carboloy or its equivalent is satisfactory.

The shape of the tool is important and the most commonly used shape is that shown in the sketch. After grinding the tool should be lapped on the face of a Norton No. 320 or a Niagara No. 400 wheel. The face, not the periphery, of the wheel should be used. In use the tool is held with the cutting edge perpendicular to the piece being turned.

The tool shape suggested above is satisfactory for small lots of material. When production lots are to be machined, it is suggested that some variations of back rake, side rake, and front relief be tried as the normal variations from lot to lot of powder may make slight differences in ma-

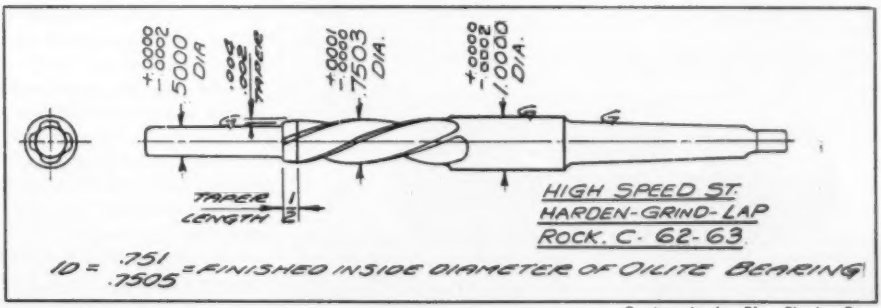
DUREX	B	E	F	S	N	R
BRONZE	0°-3°	5°-7°	5°-7°	3°-5°	2° Min.	HOLD TO
IRON	0°-3°	5°-7°	4°-6°	0°-3°	2° Min.	MINIMUM

The table, **above**, gives cutting angles of tools for use on sintered metals. Letters refer to drawing, **right**.



Courtesy Moraine Products Div., General Motors Corp.

A piloted type burnishing tool for use in drill press, screw machine or lathe, is shown **below.** Helix of spiral burnishing tools must be left handed.


+.0000 -.0002 .5000 DIA
.002 .003 THREAD
+.0001 -.0000 .7503 DIA.
+.0000 -.0002 1.0000 DIA.
TAPER LENGTH 1/2
HIGH SPEED ST.
HARDEN-GRIND-LAP
ROCK. C- 62-63
ID = .751 / .7505 = FINISHED INSIDE DIAMETER OF OILITE BEARING

Courtesy Amplex Div., Chrysler Corp.

COMPARE

your present

ALUMINUM FINISHING PROCESS

with these advantages of

IRIDITE® Al-Coat

—see for yourself why more and more finishers of aluminum products are specifying Iridite Al-Coat for any wrought, cast or buffed aluminum part.

1. IN PROCESSING

Faster—Just one simple dip, 10 seconds or only two minutes, depending upon your finishing specifications. No sealing dip, no special drying.

Simpler—Non-electrolytic, no heating or exhaust units, operates at room temperature. No special precleaning baths required.

2. IN APPEARANCE

Clear—Protects metal without changing its original appearance.

Colored—Heavier, iridescent yellow film provides greater protection.

3. IN PERFORMANCE

Corrosion Resistance—Up to 1,000 hours salt spray on wrought stock, 250 hours on castings. Approved under government specifications.

Abrasion Resistance—Will not flake or peel from buffing, bending or scraping.

Paint Base—Blocks underfilm corrosion; grips paint, holds it firmly.

Welding—Finished surface can be spot welded, coating actually aids shielded arc welding.

Conductivity—Offers low surface resistance to electrical current.

4. IN COST

Comparative figures show that Iridite Al-Coat saves as much as 50% over other aluminum finishing processes. *Let us prove this to you.*

Write today for FREE SAMPLES of Iridite Al-Coat. Or, send samples of your product for test processing.

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

REPRESENTATIVES IN PRINCIPAL INDUSTRIAL CITIES. West Coast: L. H. BUTCHER COMPANY
Manufacturers of Iridite Finishes

For further information circle No. 83 on the Reader Service Card

chinability so that a change in tool contour is desirable.

The depth of cut should be between 0.005 and 0.015. A shallower cut tends to smear the metal rather than cut it. Cutting speed between 150 and 250 feet per minute give the best results.

Generally, for I.D. cuts a more extreme front relief is required. Drilling and tapping can be done with ordinary high speed steel tools, though if carbide tipped drills are available they will give cleaner cuts and far greater tool life.

No cutting lubricant is ever used when powder parts are machined. If the material being machined has been oil impregnated by the manufacturer the oil should be removed before any machining operations. After all machining is completed the part may then be oil impregnated if it is desired.

Burnishing and Broaching Are Common Operations

Burnishing and broaching is often resorted to in order to secure a more precise fit on bearings. While every effort is made by the bearing manufacturer to avoid the necessity of these operations it is sometimes required. Burnish-broaching can be done with either a ball-type broach or with a spiral or multiple-step burnishing tool.

Reaming is generally done with standard high speed steel reamers. The largest possible number of cutting edges should be used to secure a smooth job.

Milling follows standard cast iron practice, using carbide tipped tools wherever possible. Some experimental work may have to be done to secure the best tool contour and the most economical speeds and feeds.

If the general recommendations outlined above are followed there should be no difficulty experienced in the machining of parts made from metal powders. Literally thousands of parts are machined every day and many shops that formerly thought the job could not be done, now do it as a routine operation.

ALMCO BUYS DISTRIBUTION AGENCY

R. C. Trow, general manager of the Almco Division, Queen Stove Works, Inc., Albert Lea, Minn., has announced the purchase by Almco of the R. F. Wuerfel Co., Detroit, former distributor of Almco products in Ohio, Michigan and Indiana. Although research and sample processing facilities are being enlarged, no personnel changes are contemplated, and R. F. Wuerfel, former owner, will continue as branch manager. Almco Division manufactures barrel finishing equipment and supplies.

GOODSELL WILL REPRESENT ENTHONE

Robert B. Goodsell has been appointed sales and service representative for Enthone, Inc. of New Haven, Conn., in the middle west. Mr. Goodsell will act as technical service representative and consultant for all of Enthone's products including those for coloring and blackening of metals, stripping of enamels and metal coatings, plating on aluminum and general cleaning and pickling products.

APPOINT SALES REP

The Denison Engineering Company has announced the appointment of Leonard J. Freeman as district field engineer for the marketing area of eastern Iowa and northern Illinois with the exception of the immediate vicinity of Chicago. Mr. Freeman until recently has been associated with the Chicago office of The Denison Engineering Company as direct factory representative and field engineer in the Chicago area.

CONTRACTORS-SUPPLIERS BROUGHT TOGETHER BY NAVY LISTINGS

A new listing of certain components which are in short supply will be posted by the Navy Material Inspection Service in a move to aid small businesses and to assist prime contractors.

The list, which will be kept up-to-date at regular intervals, is available for inspection at any one of the 80 offices of the USN Material Inspection Service. It will be broken down into the following categories: electronic and electrical items, fabricated metals, forgings, castings, paper and wooden products and miscellaneous items. Listing will give the prime contractor, the subcontract item needed and specifications.

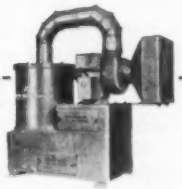
If this method of advising prospective subcontractors of primes actually in need of component production actually proves successful, it may be expanded.

TO DIRECT PURCHASES

Thomas W. Curtin has been appointed Director of Purchases of the Philadelphia Division, Yale & Towne Manufacturing Company. Mr. Curtin, who was formerly assistant director of purchases succeeds W. B. Crossland, who recently resigned.

Why it pays to SPIN-DRY plated work—small lacquered parts

Choose from 3 carefully engineered models . . .



1. **Standard Model.** Takes nearly every type of part. Built for long, trouble-free service.

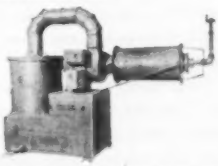
Saves time . . . With the New Holland Kreider Dryer operating at 625 r.p.m. on only ¾ h.p. you can *spin-dry* a basket of parts (1140 cu. ins.) in as little as 35 seconds—no more than 2 minutes.

Improves quality . . . With a New Holland Kreider Dryer, high speed centrifugal spin-drying eliminates scarring and marring, assures smooth evenly dried surfaces, with longer lasting luster . . . fewer "rejects."

Cuts costs . . . What's more, though a New Holland Kreider Dryer occupies less than 6 sq. ft. of floor space, it's a big money saver. Power costs are low, production high—with little or no maintenance over years. And one man can operate it, easily, efficiently.

See for yourself. Write Department D-101 today for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.



2. **With Auxiliary Steam Heating Unit.** Used for small parts that hold moisture—lacquered parts—or where cold water rinse is used.

3. **With Auxiliary Gas Heating Unit.** Used for small parts. Caution: Do not use with inflammable materials.

NEW HOLLAND KREIDER DRYER

For further information circle No. 99 on the Reader Service Card

ROAD TESTED CHROME SUBSTITUTE FINISH stands up well after 10,000 miles

AN ALTERNATE finish for chrome plate, applied over zinc die castings and steel stampings on an automobile, has been subjected to a 10,000-mile road test to determine the effects of diverse exposure conditions.

All of these tested parts were recently exhibited at the convention of the American Electroplater's Society by Allied Research Products, Inc., who manufacture the substitute finish.

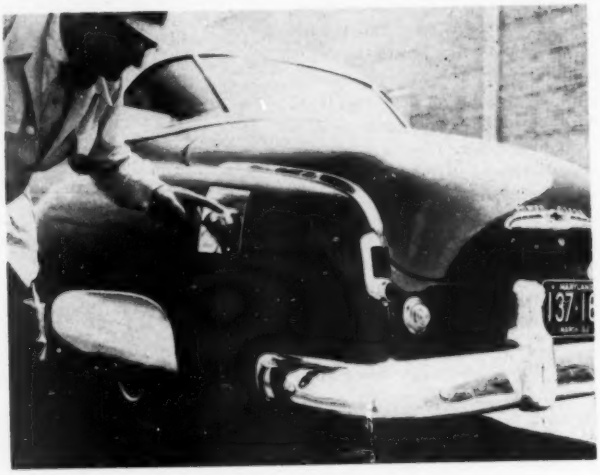
Probably the largest single user of chrome plate, and at the same time, the one with the most difficult specifications to meet, is the automotive industry.

The parts being tested were finished with zinc plate, Iridite (a proprietary material manufactured by Allied Research) and then coated with either air dried or baked clear lacquer. Iridite is a chromate type conversion coating which produces an inert surface suitable for corrosion resistance or paint base.

The 10,000 mile route covered the nation and passed through many severe types of weather and terrain, including industrial areas, dirt roads, alkali deserts and the East and West Coast salt atmospheres.

Parts under test included front and rear bumper guards, gas tank flap, fender skirts, door handles, heater duct and others. These were specifically chosen to provide comparative results for both interior and exterior hardware and trim located at various points on the car.

At present status, these Iridite treated parts are showing excellent condition compared with chrome plated parts.



Examining chromate type conversion coating

ABRASIVE BLAST CLEANING USED ON INVESTMENT CASTINGS

Typical investment casting

Pangborn abrasive blast

ABRASIVE blasting is one of the standard procedures for cleaning up the surfaces of investment castings. Despite the high degree of surface smoothness achieved by this process, there is often a certain amount of cleanup work to do, such as the removal of small inclusions of the investment material, small burs or fins and minute surface defects.

These abrasive blast operations are usually manually controlled and are very rapid. Shown here is a typical abrasive blast setup at the plant of

THEY COME THROUGH FAST WITH

RESINALL® METALITE® CLOTH BELTS

The preplating polishing of auto bumper guards becomes a high speed, low-cost production process with these RESINALL METALITE abrasive belts. With the right contact wheel, the belt easily adapts itself to the contours of the job. And with each aluminum oxide grain held securely in its original cutting position, like a lathe tool gripped by its tool holder, RESINALL METALITE Belts continue their abrasive action long after ordinary belts are worn out. No rubbing and no excessive loading, either. The heat-proof bond won't soften under the heat of continuous production finishing.

See this profitable production method in action. Our Field Engineers can show you in your own plant, or in a nearby BEHR-MANNING Demonstration Room. Make a date now.

NEW PACKET ON POLISHING

"Blueprints for Faster, Better Production," is full of new, proven methods of polishing. Mail the coupon below for your free copy. Address Dept. DC-10.

BEHR-MANNING
DIVISION OF NORTON COMPANY
TROY, N. Y.
COATED ABRASIVES + SHARPENING STONES
PRESSURE-SENSITIVE TAPES
Export: Behr-Manning Overseas Inc., New Rochelle, N. Y., U.S.A.
Canada: Behr-Manning (Canada) Ltd., Brantford, Ont.

NORTON abrasives

BEHR-MANNING, Troy, N. Y., Dept. DC-10.
Please send me "Blueprints for Faster, Better Production."

Name ..... Title .....
Company .....
Street ..... County .....
City ..... Zone ..... State .....

For further information circle No. 86 on the Reader Service Card

TAP-LOK INSERTS

save Man-hours and Customers

U. S. Patent 2,455,805

STRIPPED threads quickly kill customer goodwill. To prevent tapped thread failure in light metals, plastics, wood and similar materials, sound engineering calls for some form of hard bushing to increase the shear area. Among the various types available, TAP-LOK INSERTS have several important advantages:

(1) Self-tapping, they save many man-hours in assembly, in continuous production.

(2) They hold rigidly in position.

(3) Their cost is relatively low.

The TAP-LOK INSERT is quickly installed with a simple driving tool into a cored or drilled hole equal in size to a tap drill hole for the external thread of the Insert. It cuts its own thread, saving the cost of a separate tapping operation. It remains secure because the torque necessary to dislodge it is greater than the torque a standard machine screw can withstand. It suffers none of the uncertainties and losses in assembly that accompany the use of molded-in and cast-in inserts.

Send for samples and descriptive folder.

Also manufacturers of Groov-Pins—for positive locking press fit.

GROOV-PIN

GROOV-PIN CORPORATION

1122 Hendricks Causeway
Ridgefield, New Jersey

Circle No. 94 on the Reader Service Card

an investment casting company, the Harcast Company of Glenholden, Pa.

The Pangborn cabinet unit has proved to be suitable for this type of operation, with the part being turned by hand to expose all surfaces to the effects of the fine abrasive blast.

The casting shown here is typical of intricate small parts produced by investment casting. Weighing less than half an ounce, it has 52 separate surfaces. Since high quality surface finish is one of the sales features of investment casting, the use of abrasive blast for light surface cleaning is an essential step in the processing.

PLATING PROBLEMS?

SWITCH TO

ENLEY!

COPPER SPEED*
COPPER SPEED BRIGHTENER*

SILVER SPEED*
SILVER SPEED BRIGHTENER*
SILVER SPEED CONDUCTING SALTS†

These ENLEY Products are designed to convert old solutions into baths which are new, giving high-speed bright deposits at a low cost.

*$10.00 per gallon, F.O.B., N.Y.C.
†$25.00 per 100 lbs., F.O.B., N.Y.C.

ENLEY PRODUCTS, INC.
254 PEARL STREET
NEW YORK 38, N. Y.

• DISTRIBUTORS INQUIRIES INVITED

Circle No. 93 on the Reader Service Card

TSUGAMI OF JAPAN WILL PRODUCE HELI-COIL INSERTS

The Heli-Coil Corporation of Danbury, Conn., manufacturer of helical-wire thread inserts for the protection and repair of tapped threads, announces the departure of Eugene M. Lang, vice-president in charge of manufacturing, to Japan to complete licensing arrangements and set up the production of Heli-Coil thread inserts and tools in the plant of the Tsugami Manufacturing Company, Ltd. of Tokyo.

This licensing arrangement will give the Tsugami organization the sole right to manufacture and distribute Heli-Coil thread inserts in the Far East.

ELECTROPLATING CAPACITY ADEQUATE

The Electroplating Industry Advisory Committee has advised the National Production Authority that it believes the present capacity adequate, and that in its opinion certificates of necessity for rapid tax amortization should not be granted to create new electroplating facilities. The committe recommended a survey to determine the ability of the industry to fill defense orders.

ENAMEL FILL Your Die-Cast Parts

In Color With Lettering and Design

5 TIMES FASTER Than Hand Filling

The Acroprinter illustrated shows only one type of machine we build for color filling of lettering and design with enamel. Send samples of parts you wish to fill for estimates.

The ACROMARK Company

426 Morrell St., Elizabeth 4, N. J.
"The Original Marking Specialists"

For further information circle No. 82 on the Reader Service Card

Cowles A M CLEANER

THE NEW NON-ETCHING TYPE ALUMINUM CLEANER FOR USE IN SOAK TANK CLEANING

THE NON-ETCHING CLEANER THAT REALLY CLEANS

It was specifically designed to remove drawing, stamping, spinning compounds, rolling oils, marking inks, crayon marks and general shop dirt from common aluminum alloys prior to spot welding, anodizing or other finishing operations.

COWLES TECHNICAL SERVICE
Gladly Furnished Upon Request

TRY COWLES A M CLEANER FOR A BETTER, QUICKER JOB OF CLEANING ALUMINUM

WRITE FOR TECHNICAL DATA SHEETS

PROMPT SHIPMENTS FROM WAREHOUSE STOCKS

COWLES CHEMICAL COMPANY
METAL CLEANER DEPARTMENT
7016 Euclid Avenue • Cleveland 3, Ohio

NOTE Try Cowles P.C. Cleaner if you want a cleaner that really gives a rapid etch.

For further information circle No. 89 on the Reader Service Card

Backstand Method Saves Time!

Milwaukee Electric Tool Corp. eliminates one complete operation . . . increases production 40% . . . gets better finish on tools!

Problem: The Milwaukee Electric Tool Corp. had a time-consuming method for sanding cast aluminum motor housings for portable electric tools. First they polished with a hard wheel. Then they sanded with a #46 set-up wheel and finished with a grit #100 set-up wheel. This was too long and too costly an operation.

Solution: The Milwaukee Electric Tool Corp. switched from the hard wheel and set-up wheels to the backstand belt for this polishing job.

Result: Now one Armour Backstand Belt does the work of the hard wheel and the #46 set-up wheel—eliminating one operation. A better finish is obtained and production is up 40%!

Manufacturers of hundreds of different industrial and consumer items have proved that the backstand belt method is more efficient and more economical than the set-up wheel.

If you are grinding, polishing or finishing flat or contoured surfaces, cast pieces, stamped pieces or forged pieces, the backstand method can help you with your production problems.

To learn more about advantages of the backstand belt method, write for our free booklet.

We recommend buying through your Industrial Distributor

MAIL THIS COUPON TODAY

Please send me the booklet "Facts about Backstand Belt Grinding and Polishing."

Name .....

Title .....

Firm .....

Address .....

City ..... *Zone* ..... *State* .....

Armour's abrasive belts are only part of a complete line of abrasives built to rigid quality specifications. There are sheets, rolls, discs, and other more specialized shapes.

ARMOUR *Coated Abrasives Division*

SHEETS • ROLLS • BELTS • DISCS

Armour and Company • North Benton Road • Alliance, Ohio

For further information circle No. 85 on the Reader Service Card.

PMM NEW PRODUCTS

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail — no postage is required.

MOLDS FOR CASTING PLASTER, WAX OR STYRENE

Juelite Flexible Molds
Santa Anita Chemical Corp.

SPECIAL FEATURES: These are flexible plastic molds designed and made for casting plaster, wax or styrene. They can be used in either plaster mold or investment casting. Advantages claimed for these molds included ease of stripping out patterns or molds with undercuts, long mold life and the elimination of sealing agents and parting agents.

SPECIFICATIONS: The molds can be supplied either in Plastiflex or Plastisol. Plastiflex molds are used for casting plaster molds and wax patterns, or other materials which do not involve temperatures over 180 F. Plastisol molds can be used for casting polyster-styrene resins as well as phenolics. The company also supplies casting resins of polyster and phenolic types.

For additional information circle No. 144 on the Reader Service Card.

AIR-OPERATED HYDRAULIC PRESSES

2½ and 6 Ton 2" and 5" Ram Cycle Series
Air-Hydraulics, Inc.

SPECIAL FEATURES: These presses will deliver up to 6 tons pressure utilizing 100 psi air inlet pressure. They can be used for flash trimming, staking, riveting, assembling marking, broaching forming or crimping. They are available in bench or floor-mounted styles with hand, foot or electrically-controlled operating valves.

SPECIFICATIONS: Controllable ram speed. Pressure may be controlled so as to be constant throughout the ram stroke. Adjustable ram stroke. They will accommodate work up to 12" in diameter. Reservoir automatically maintains proper level of oil in hydraulic system. All models are equipped with air filters, oilers to provide lubricated air, air gauge and exhaust muffler.

For additional information circle No. 145 on the Reader Service Card.

ONE POUND SHOT DIE CASTING MACHINE

Model IMP-96
DCMT Sales Corp.

SPECIAL FEATURE: This is an air-operated die casting machine for use in making zinc die castngs up to 12 ounces in weight. It uses .55 cu. ft. of free air per cycle, and can therefore be operated with a small compressor if no airline pressure of 80-100 psi is available. Double-toggle air-operated die closing mechanism. Pilot-operated impact type injection cylinder has slide valve controlled by trip lever. Safety interlock valve prevents metal injection before dies are closed.

SPECIFICATIONS: Metal pressure with 1½"-diameter plunger is 1620 psi. Accommodated die plates of 9" x 6" x 1½". Die opens 4". Locking pressure is 12 tons. Maximum area and size of casting, 12 sq. inches and 12 ounces. Pot capacity 45 pounds. Floor space 30" x 12". Space between tie bars 6¼".

For additional information circle No. 146 on the Reader Service Card.

REGRINDING DRILLS

Dumore Drill Grinder
The Dumore Co.

SPECIAL FEATURES: This drill grinder is said to be so simple in operation that untrained help can grind drills right the first time they try. The company states that the machine's speed enables a tool crib apprentice to handle all drills in an average shop or department.

SPECIFICATIONS: Any included angle of drill point from 93° to 160° can be obtained, and any clearance angle from 5° to 15°. Quick-locking chuck has an infeed for fine or small work. Combined drill rest and diamond holder is provided. Standard equipment includes 1¼" collet, chuck extension drill holder for No. 552-70 drills, diamond wheel dresser and set-up gage. A large number of number, letter and fractional size collets are available as optional equipment.

For additional information circle No. 147 on the Reader Service Card.

REDUCES POWDERS TO SUB-MICRON SIZES

Wheeler Fine Particle Mill
Models 0405 and 0808
C. H. Wheeler Mfg. Co.

SPECIAL FEATURES: This mill is designed to reduce metal powders in size from a minus 4 mesh or smaller down to sub-micron size. The mill works on a principle of near sonic speed vapor hurling the particles against each other, with smaller particles moved to the center by centrifugal force where they are drawn off.

SPECIFICATIONS: Minimum floor space required is 8' x 12'. The mill has no moving parts. Can be used with a continuous feed mechanism. Model 0405 will handle 200 to 1800 lb. feed rate per hour, Model 0808 400 to 6500 lb. feed rate per hour. Velocity, humidity, pressure and temperature of the operation can be controlled.

For additional information circle No. 148 on the Reader Service Card.

SIMPLIFIED DRILLING UNITS

Model No. 1000 Series Drilling Units
Black Drill Co.

SPECIAL FEATURES: Motor shaft is integral with rotor on these drills, eliminating splines, gears, cams, belt, clutches and brakes. Three adjusting screws permit adjustment of feed rate, length of stroke, depth control and rapid advance while unit is operating.

SPECIFICATIONS: All major parts are one-piece castings. Hydraulic unit for controlling feed rate has side bars moving in oil-less bushings to carry the rapid advance adjusting bolt. Units may be operated in any position and at any angle, in either single or multiple set-ups.

For additional information circle No. 149 on the Reader Service Card.

SMALL HELI-COIL INSERTS

8-36 and 6-40 Sizes in Fine-Thread Series
5-40 and 4-40 Sizes in Coarse-Thread Series
Heli-Coil Corp.

SPECIAL FEATURES: Designed to give small size anti-stripping, anti-abrasive and anti-corrosive threads in housing of sewing machines, vacuum cleaners, adding machines and similar units, the inserts are small stainless steel helical wire coils. They are inserted with a special tool in tapped holes in zinc, aluminum, magnesium, brass or bronze castings to give threads superior in strength to those composed of the casting material.

SPECIFICATIONS: Spring action of inserts give thread engagement of 90 percent or better. Sizes available include 8-36 and 6-40 sizes in the fine-threaded series, 5-40 and 4-40 in the coarse-thread series. They are available in 1, 1½ and 2-diameter lengths.

For additional information circle No. 150 on the Reader Service Card.

NEW

HEAVY DUTY DIAL FEED

4, 6, 9, 12, 18 or
36 positions

★

Positions up to 1000 lbs.
quickly and accurately

★

Positive locking

★

Can be mounted in
any position

LIGHT DUTY DIAL FEED

Model BRET-10C has a 10" diameter table top. Will position loads up to 500 lbs. Adjustable to position 4, 6, 8, 12 or 24 stations.

Bellows Model BRET-22 Rotary Feed Table is an electrically controlled, air-powered unit for dial feeding work pieces to drilling machines, tappers, reamers, press rams, etc.

Powered by a 3⅝" bore Bellows Air Motor, the standard 22" diameter table top will position loads of 1000 lbs., quickly and accurately.

At each station the table top comes to a stop gently, without abrupt impact, and is locked into position by a 1¼" bore air cylinder. Model BRET-22 is easily synchronized electrically to other machine operations.

The 22" diameter mild steel table top is easily removed for mounting jigs, fixtures, or oversize table top. Standard models can be set to position 4, 6, 9, 12, 18 or 36 positions.

Write for Bulletin T-85 Today! Address: The Bellows Co., Dept. DC-1051, Akron 9, Ohio

The Bellows Co.

AKRON 9, OHIO

1305

For further information circle No. 87 on the Reader Service Card

WET BLAST MACHINE

Liquamatte

American Wheelabrator & Equipment Corp.

SPECIAL FEATURES: This machine is intended for work on which dry blasting is too severe, such as work with thin edges or sharp corners. Vertical pump for slurry recirculation eliminates suction piping, valves and fittings. Also eliminates plugging of impellor when machine is shut down. Armholes equipped with gauntlets so worker can use own gloves and small work passed through armholes without opening doors.

SPECIFICATIONS: Rubber hose in place of metal pipe increases life and reduces water hammer noise. Available reset timer indicates number of operating hours slurry has been in machine. Air ejector removes slurry through hose without operator handling it in any way. Fluorescent lighting does not cause slurry to bake on inspection window. All abrasives and chemicals needed are carried in stock. Abrasives stocked from 80 to 2500 mesh.

For additional information circle No. 151 on the Reader Service Card.

BAND-SAW GUIDE HOLDS BLADE AT ANY ANGLE

Model 20 Band Saw Blade Guide

Paddock Tool Co.

SPECIAL FEATURES: This guide, when attached to a band-saw machine, can be used to cut at any angle. The working portion of the blade can then be held in such a position that more work can be performed.

SPECIFICATIONS: Each wheel is supported on ball bearings, reducing the danger of stretching band-saw blades to the breaking point. Simple adjustments for the width, thickness and angle of cut.

For additional information circle No. 152 on the Reader Service Card.

PERMANENT MOLD MACHINE

Permanent Mold Operating Machine

Standard Machinery Co.

SPECIAL FEATURES: This machine has been designed especially

To meet MILITARY SPECIFICATIONS

for Cleaning • Rust-Removing • Etching Phosphatizing and General Metal Conditioning of all kinds of Metal Surfaces

Use PREP PRODUCTS!

SPECIFICATION NUMBER	CONFORMING MATERIAL
MIL-C-5541 (see also QPL-5541-1)	Lyfanite
MIL-S-5002	Lyfanite
MIL-E-10578	
Type 1	Metalprep Nos. 77, 102—Alumiprep No. 1
Type 2	Metalprep Nos. 10, 15—Alumiprep No. 20
JAN-C-490—Grade II	
Type 2	Emulsoprep
Type 4	Metalprep, Prep-Rite-L, Alumiprep, Prep-Rite
Type 5	Metalprep, Alumiprep, Prep-Rite-L, Prepwash
Type 6	Emulsoprep No. 710-E.C.
U.S.A. 3-213	(See MIL-C-10578)
U.S.A. 3-192	Metalprep Nos. 28, 10, 15
	Alumiprep No. 20
U.S.A. 98-20007	Metalprep Nos. 10, 15
	Alumiprep No. 20
	Prep-Rite No. 16
U.S.A. 72-53	(See AN-F-20)
AN-F-20	Lyfanite
	Metalprep Nos. 10, 15, 77, 102 — See MIL-C-10578
	Alumiprep Nos. 1 and 20
AN-E-19	Lyfanite
AN-C-170	(See MIL-C-5541)
TAC-ES-431	(See MIL-C-10578)
AXS-1245	(See JAN-C-490, Grade II)
Engineering Corps—T-1184	Metalprep No. 28
U.S.N.—Appendix 6	Metalprep

Send for Data Sheet • Advise Govt. Spec. Number

51-C

NEILSON CHEMICAL CO.

3682 Tecumseh Rd., Windsor, Ont. — 6563 BENSON ST., DETROIT 7, MICH. — 3411 Union Pacific Ave. Los Angeles 23, Calif.

For further information circle No. 97 on the Reader Service Card

CUT SPRAY PAINTING COSTS on many defense items

such as the shells and rocket bombs illustrated, by sharply increasing production through the use of

ELECTRO-FORMED METAL MASKS

(MADE BY PATENTED PROCESS)

designed to fit into your conveyorized equipment.

We also design, engineer and build

COMPLETE AUTOMATIC SPRAY EQUIPMENT

(With or Without Masks)

MASK WASHING EQUIPMENT

and AIR-OPERATED

CLAMPS, FIXTURES AND TOOLS for

positioning parts in masks while painting or holding parts in place for other operations, such as welding.

Plug-type masks for keeping depressed areas clear, while spraying background; lip-type masks for protecting the background while painting depressed areas; and block cutout plane surface type masks.

Clean, sharply defined letters and decorative effects are obtained on intricate die castings, stampings and plastic forms by accurate control of painted areas with no fogged edges. After-wiping or buffing off of overspray is unnecessary. The "loose" inside of letters and numerals, such as "O" and "6", is held in position by arched bridging to eliminate objectionable "ties."

SEND COUPON NOW!

CONFORMING MATRIX CORPORATION

346 Toledo Factories Building — Toledo 2, Ohio

Please send, without obligation, details on ( ) Hand masks; ( ) Mechanical masking fixtures; ( ) Air-operated masking fixtures; ( ) Stationary automatic spray painting masking machines; ( ) Rotary table automatic spray painting masking machines; ( ) Quotation on masks for parts (or prints) which I am forwarding.

NAME .....

FIRM .....

STREET .....

CITY & STATE .....

For further information circle No. 88 on the Reader Service Card

WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning

Oakite's FREE Booklet

"Some good things to know about Metal Cleaning"

answers many questions that mean better production, more profit for you. Just look at the table of contents:

- Tank cleaning methods
- Machine cleaning methods
- Electrocleaning steel
- Electrocleaning nonferrous metals
- Pickling, deoxidizing, bright dipping
- Pre-paint treatment in machines, in tanks and by hand
- Paint-stripping
- Steam-detergent cleaning
- Barrel cleaning
- Burnishing
- Better cleaning in hard-water areas
- Treating water in paint spray booths
- Rust prevention
- Machining and grinding

FREE For this 44-page illustrated booklet, write Oakite Products, Inc., 34G Thames St., New York 6, N. Y.

Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

For further information circle No. 100 on the Reader Service Card

to maintain a square condition between the two mold holding platens, thereby reducing flash to the minimum. It also helps in holding tolerances across the parting line.

SPECIFICATIONS: A center guide groove through the bed permits both platens to be fitted to the bed and held square by means of tongues. The moving platen is equipped with tapered guide and holddown gibs that maintain its squareness in all three planes. Hydraulic shock absorbers cushion both opening and closing strokes. Optional air or hydraulic operation.

For additional information circle No. 153 on the Reader Service Card.

SILVER SOLUTION BRIGHTENER

Silver Speed Brightener
Silver Speed Conducting Salts
Enley Products, Inc.

SPECIAL FEATURES: The brightener is used in the standard fashion to increase the brightness of silver plating. According to the manufacturer, it also reduces the consumption of cyanide in the solution. The conducting salts are used to permit higher current densities without burning during the plating operation.

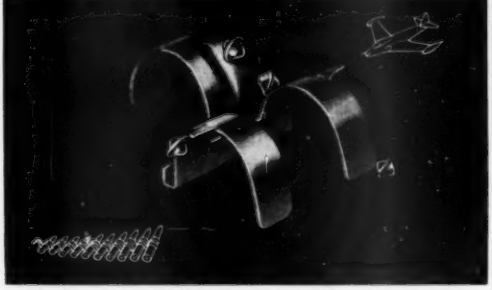
SPECIFICATIONS: One gallon of brightener is used with 550 gallons of silver solution; brightener is sold in one, five- and 12-gallon units. Conducting salts are used 16 ounces to one gallon of silver solution. Sold in 25, 50, 100, and 500 pound units.

For additional information circle No. 154 on the Reader Service Card.

T. R. WILLIAMS APPOINTED

W. J. Cluff, president of Frederic B. Stevens, Inc., Detroit, Michigan, has announced the appointment of Thomas R. Williams as sales engineer in the plating and polishing department. Williams will represent the Stevens line in eastern Ohio, with headquarters at Elyria, Ohio.

in BURNISHING MATERIALS



it's the SHAPE that counts!

Machine gun *cartridge links* — difficult to fabricate and finish — are often de-burred and burnished to rigid government specifications with Abbott Burnishing Materials. They're *shaped* to do the job right!

Abbott Burnishing Shapes — Ball, Ovalball, Cone, Diagonal, Pin — are scientifically designed to make effective contact on metal parts, stampings and castings of any size and shape. Each is made from Abbott's famed bearing ball steel, deep hardened and polished to a mirrorlike, glass hard finish . . . to guarantee superior burnishing results.

The Abbott Method of barrel finishing has solved many industrial problems for over forty years. Perhaps it can solve yours. *Write today for Abbott Catalog-Manual.*

ABBOTT

THE ABBOTT BALL COMPANY
1084 New Britain Ave.
Hartford 10, Conn., U.S.A.

For further information circle No. 81 on the Reader Service Card

COMPARE
your drilling costs with this
DUMORE
Drill Head Report

COST REPORT FROM THE FROST CO.

PROBLEM — To drill fourteen No. 30 holes in 22-gauge steel frame for freezer compartment, at lowest possible cost and without bottle-necking production line.

SOLUTION — 7 Dumore Automatic Drill Heads, gang mounted below an indexing base plate, drilled the 14 holes in 2 steps.

COST—Less than 2¢ per frame.

DAILY OPERATING TIME — Less than 4 hours per shift, freeing operator for 4 extra operations.

DRILL COST—Only 11¢ per day.

TOOLING COST — Only a fraction of competitive methods, according to user.

DDH-9 □

IF you are using No. 80 to 5/16" drills, the revolutionary Dumore Automatic Drill Head can mean tremendous cost reductions for your operations. Its ability to step up production and to reduce drill breakage and scrap loss is proved by scores of reports from enthusiastic users.

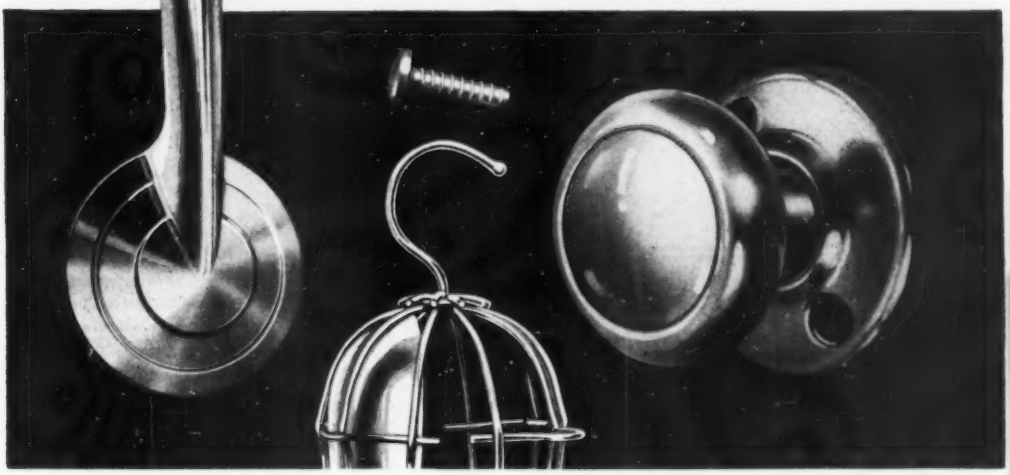
Write us today for descriptive bulletin and certified user reports. Free demonstration, on request.

The DUMORE Company
1300 17th STREET, RACINE, WISCONSIN
Export Address: 13 E. 40th St., New York, N.Y., U.S.A.

For further information circle No. 92 on the Reader Service Card

Yes—you can get

a bright finish like this



. . . with only .0003" of zinc plate and UNICHROME CLEAR DIP

No need to abandon the selling power of a sparkling finish on your product. If you can use zinc you can still get a bright finish—and a high grade one, at that. For Unichrome Clear Dip not only brightens zinc plate to *chromium-like* brilliance, but also gives it substantial resistance to corrosion, dulling and fingermarking.

If your products are subjected to exposure, handling or humidity, include an application of Unichrome Clear "Enamel" B-115. It pays off in longer life. The Clear Dip Finish gives you an excellent base for this high gloss, non-yellowing, corrosion-resisting synthetic. This finishing system, consisting of Unichrome Clear Dip plus B-115, has been used with outstanding success for years on die castings, wire goods, ice skates, bicycle parts and other products and components.

The Unichrome Clear Dip Process forms its finish chemically. It's *fast, economical, easily controlled,* and *adaptable* to manual or automatic operation. Write for Bulletin CD-3.

UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y.
Waterbury 20, Conn. • Detroit 20, Mich. • Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada: United Chromium Limited, Toronto, Ont.

You can easily meet Government specifications on chromate conversion coatings. It's easy to produce chromate finishes on zinc plate or zinc die castings with Unichrome Dips. You get black, yellow or olive drab coatings from solutions that have, to well known users, actually proved to be more economical than the "home-made" solutions replaced. Consult us on your defense finishing requirements.

UNICHROME
Trade Mark

COATINGS for METALS

ALLOY CASTING INSTITUTE EXPANDS RESEARCH PROGRAM

Significant expansion of its technical research program is being undertaken by Alloy Casting Institute to help meet mounting defense mobilization needs and other engineering and equipment requirements dependent on the use of stainless steel castings, it was announced today by E. A. Schoefer, executive secretary.

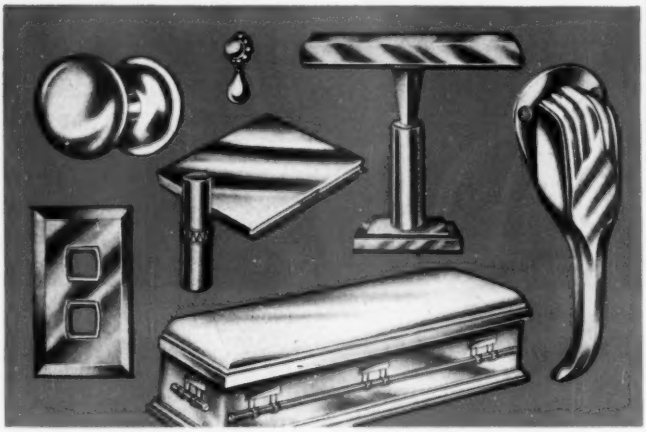
In addition to extension of continuing research activities directed toward the improvement of cast alloys widely used in the metals-treating, chemical and many other industries, Mr. Schoefer disclosed, three new projects closely keyed to current production and supply problems of the industry and its customers are being instituted at major research laboratories.

In view of the greatly increased demand for high alloy castings and the concurrent shortages of alloying elements, the ACI Technical Research Committee is concentrating its alloy conservation studies at Battelle Memorial Institute on the high temperature properties of the 21 percent chromium, 10 percent nickel type alloy.

Similarly, development of Titanium-stabilized corrosion resistant castings, important for use in expanding aircraft production, is being made the subject of an accelerated investigation to be carried out at Ohio State University.

In addition, an extensive study of improved gating systems for high alloy casting production will be conducted as part of the ACI program under way at Massachusetts Institute of Technology, under auspices of the Shop Practice Committee of ACI.

Alloy Casting Institute is the national technical organization of stainless steel casting producers. It is credited with numerous important contributions to increased knowledge of cast alloy characteristics, advanced production techniques and notable improvement in testing procedures. Headquarters of the Institute are at 32 Third Avenue, Mineola, N. Y.



NOW... simulate copper, brass and bronze on products like these with M & W PLATELUSTRE

Don't let critical metals put a *needless* crimp in your production!

Take zinc or steel—apply a coating of one of the new PLATELUSTRE finishes. You wind up with products and parts that look so much like copper, brass and bronze that *the eye can scarcely tell the difference!*

Whether you have been using now unavailable copper and its alloys for *making* products or for *plating* products, you will find these new M & W finishes *equally* effective in keeping your plant running. There are types for air-drying and baking schedules—pick the one that best fits *your* production requirements.

Let an M & W Technical Service Engineer show you—*right in your own plant*—how easy these PLATELUSTRE coatings are to use, and what striking effects they produce. Or, if you prefer, write for free literature.

PIONEERS IN PROTECTION

75th ANNIVERSARY M & W CO. 1876

MAAS & WALDSTEIN CO.

MID-WEST DIV.-1658 CARROLL AVE., CHICAGO 12, ILLINOIS
PACIFIC COAST DIV.-SMITH-DAVIS CO., 10751 VENICE BLVD., LOS ANGELES 34, CAL.
MANUFACTURERS OF INDUSTRIAL FINISHES

For further information circle No. 95 on the Reader Service Card

BRITISH MACHINE TOOLS FOR AMERICAN INDUSTRY

Irwin Lubalin, general manager of the machine tool division of the British Industries Corp. left recently for England to attempt to expedite delivery of machine tools to American industry. Over $9,000,000 worth of British machine tools are scheduled for delivery over the next two years.

ALCOA BUILDS SMELTING PLANT USING LIGNITE FUEL

A new aluminum smelting plant, the first in history to use lignite (sub-Bituminous coal) for fuel, will be built by Aluminum Company of America.

Aluminum Company of America has confirmed an announcement by Congressman W. R. Poage, Democrat of Texas, that the company has applied to the Department of the Interior for a certificate of necessity to begin construction of the plant in the immediate future 60 miles south of Waco, Texas.

ACTUAL UNRETOUCHED PHOTOGRAPH

A CASE HISTORY FROM THE STEVENS EXPERIMENTAL POLISHING AND BUFFING LABORATORY

Here is a step-by-step example of how Stevens' customer-service works in actual operation. The customer in this case was a plumbing fixture manufacturer who asked the Stevens experimental polishing and buffing laboratory to develop the most efficient methods and recommend the correct compositions for giving a high luster to chrome-plated brass bath fittings. These were the findings:

POLISHING: The brass rough casting (1) was put through three polishing operations—ROUGHING with No. 80 Artificial Abrasive on a 16-inch wheel at 1900 r.p.m., dry; FINING with No. 120 Artificial Abrasive on a slightly softer wheel, also dry, and OILING with No. 180 Natural Emery on a ¾" spiral sewed 14-inch canvas polishing wheel (medium hard) at 1900 r.p.m., lubricated with Stevens No. 2 Tallow Stick.

BUFFING: The polished casting (2) was then buffed with Stevens No. 47 Tripoli on a Stevens radial sewed, 16-pocket, 86/93 count buff 14 inches in diameter at 2100 r.p.m. The casting (3) was then ready for electroplating.

COLORING: Following the electroplating process the casting was buffed with Stevens No. 101 Chrome Composition on a Stevens 64/64 folded buff, 14 inches in diameter at 2100 r.p.m. The resultant beauty and high luster is apparent in (4)

This is a typical case where Stevens' technical and research facilities were able to bring to a customer the exact, tailored polishing and buffing techniques for his specific operations. We will be glad to do the same for you. Just call your Stevens representative or write direct to *Frederic B. Stevens, Inc., Detroit 16, Michigan,* for full details on how to avail yourself of Stevens' customer-service for polishing and buffing problems. There's no obligation.

METAL FINISHING EQUIPMENT AND SUPPLIES SINCE 1883

FREDERIC B. STEVENS INCORPORATED

DETROIT 16, MICHIGAN

For further information circle No. 101 on the Reader Service Card

PMM USEFUL LITERATURE

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

PROCESSES

Helpful Publication List: No. 183
A list of publications and reprints offered by the International Nickel Co., Inc. is available from the company. All types of metal molding using alloys with nickel content are covered, and applications of these parts in various industries also have an index. There are also several papers on nickel plating listed.

Die Steel Can Be Hobbed: No. 184
A steel that can be used for zinc die casting dies is covered in Booklet 271, offered by the Bethlehem Steel Co. Duramold A, as the steel is called, offers important savings on machining costs of intricate dies in that it can be hobbed.

Intricate, Precise Parts by Electroforming: No. 185
Electroforming, a process of electrodepositing metals on a form, can be used to make precision parts with intricate contours. An illustrated folder on the process is available from Bart Laboratories Co., Inc.

Permanent Mold Casting Plant: No. 8
The facilities offered by Aluminum Industries, Inc. for the manufacture of aluminum permanent mold castings are shown in detail in Bulletin 20A, available from the company.

Articles on Powder Metallurgy: No. 186
A number of technical papers and practical articles on powder metallurgy are available in reprint form from the American Electro Metal Corp. These papers were written by members of the staff of the company.

Screening Powdered Metals: No. 187
Power-operated screens for separating and grading powdered metals are shown and described in a booklet published by the Patterson Foundry & Machine Co.

First Issue of Powder Metal Bulletin: No. 188
Production of a component of an artillery shell from powdered brass is discussed in the first issue of a new publication, "Bound Brook Bulletin" available from Bound Brook Oil-Less Bearing Co. Information on self-lubricating bearings is also included, along with interesting information on structural parts manufactured by powder metallurgy.

Tips on Powder Metal Design: No. 189
A number of parts made by powder metallurgy are illustrated, and a section showing those forms that can be molded and those that must be machined, are in a folder offered by the Chicago Powdered Metal Products Co.

Powder Metallurgy Handbook: No. 190
All phases of the powder metallurgy process are covered in a 56-page booklet offered by the Moraine Products Div., General Motors Corp. Design rules are given and examples illustrating them are included.

MATERIALS & EQUIPMENT

Evaporative Cooling For Oil Quenching: No. 191
Cooling and circulation of quench oils and how they can be used to assure scientific control and insure quality and quantity production is explained in Bulletin D-350-2, offered by the Trane Co.

FINISHING

Abrasive Belt Machines: No. 192
All types of abrasive belt machines, including wet and dry-belt grinders, centerless belt grinders, backstand idlers and contour grinding and polishing machines are illustrated and described in a catalog offered by the Porter-Cable Machine Co. Complete specifications are given for each machine along with the scope of its uses.

Chart on Metal Cleaners: No. 193
A selection chart listing phosphoric acid metal cleaners and rust removers manufactured by the American Chemical Paint Co. is available from the company. The chart gives information on strength, temperature limits, sequences of operation and equipment required for each compound.

Live Centers for Grinding: No. 194
A line of heavy-duty spring-loaded and non-spring-loaded live centers is illustrated and described in literature offered by the Bultool Co. These centers are designed for use in precision grinding operations.

Abrasive, Burnishing and Drying Compound: No. 195
A barrel finishing compound that can be used for abrasive, burnishing and drying is manufactured by the Agri-Indus Mfg. Co. Called "Cocob", the compound is made of macerated corn cobs and will absorb 375 percent of its own weight in water. Samples and literature will be sent by the company.

Standard Air and Oil Cylinders: No. 196
A line of air and oil cylinders including 28 models, each offered in nine bore diameters, is illustrated and described in Catalog No. 55, available from Rivett Lathe & Grinder, Inc. Working drawings and complete specifications are included for each cylinder.

Cross-Reference for Drill Jig Bushings: No. 197
Ace Drill Bushing Co. has prepared a catalog of their drill jig bushings that includes a cross-reference table of drill jig bushings made by other manufacturers of these items. The catalog also contains a cross-reference to some 3023 symbols used by other manufacturers.

Cleaning Metals in Aircraft Production: No. 198
Specialized materials, equipment and procedures for use in cleaning metals, preparing metals for finishing and for other cleaning and related processes involved in aircraft production are described in a 48-page booklet offered by Oakite Products, Inc.

continued on page 74

paper sculpture by gerstein

THE WISDOM OF EXPERIENCE

assures the highest purity and efficiency in

NIALK* *TRICHLORethylene*

for metal-cleaning and degreasing.

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

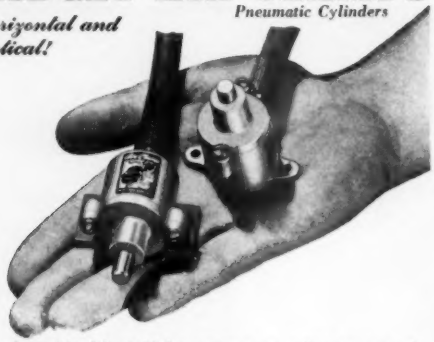
Liquid Chlorine • Caustic Potash • Carbonate of Potash • Paradichlorobenzene • Caustic Soda
TRICHLORethylene • NIAGATHAL* (Tetrachloro Phthalic Anhydride)
*Trade-mark

For further information circle No 98 on Reader Service Card.

Cut Costs with MEAD
MIDGET AIR CLAMPS

Horizontal and Vertical!

Pneumatic Cylinders



Both models deliver 80 lbs. pressure on a line pressure of 100 lbs. They'll save countless man-hours in assembly operations involving welding, riveting, bolting, etc. Advantages over mechanical clamps: 1, Any number can be operated by single master valves. 2, Easily installed in cramped corners. 3, Equal ram pressure at any stroke point. Send for new Mead AIR POWER Catalog, describing our line of Air Clamps, Air Vises, Air Presses, Work Feeders, Valves, Controls, etc.

MEAD
SPECIALTIES COMPANY

4114 NO. KNOX AVE., Dept. DC-101 CHICAGO 41, ILL.

For further information circle No. 96 on the Reader Service Card

USEFUL LITERATURE (Continued)

Repairing Cutters and Other Tools: **No. 199**

The repair of milling cutters and other cutting tools can be accomplished on the No. 2 Cutter and Tool Grinder. This tool, which is manufactured by the Cincinnati Milling Machine Co., is described in a 40-page catalog offered by the company.

Lapping and Polishing Carbide Dies: **No. 200**

Dymo-C, a diamond abrasive especially prepared for lapping and polishing carbide drawing and heading dies, is described in a folder available from the Abrasives Div., Elgin National Watch Co.

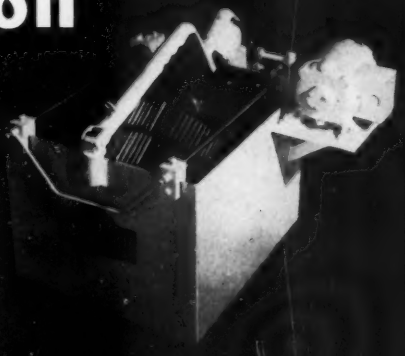
Tumbling Compound for Ferrous Materials: **No. 201**

Tumb-L-Magic, an abrasive wet-process tumbling compound that has a chemical cleaning action upon the work, is described in literature available from Tumb-L-Matic, Inc. By suspending grease and cuttings in solution, the compound is said to keep the work and abrasive media free from accumulations.

Masks for Spray Painting: **No. 202**

Five basic masks that can be used for selective spray painting are covered in a bulletin offered by Thierica Studio. The bulletin also tells how the masks are used, and gives the proper choice for each spray painting problem.

THE NEW DANIELS 8H



Daniels presents the radically new 8H Plating Barrel with these innovations:

- **New Cylinder Arm and Arm-lock**
- **New Materials and Modern Design**
- **New rubber-covered Contact Frame**
- **Three Cylinders to choose from — Bakelite, Rubber or high-temperature Lucite**

Designed to fill the demand for a small barrel for efficient plating of small lots of bulk parts, the 8H is ideally suited for precious metal plating, laboratory work and as a supplement to the production plating plant.

DANIELS PLATING BARREL & SUPPLY CO.

MANUFACTURERS & DISTRIBUTORS
Electroplating and Polishing Equipment and Supplies

129 Oliver Street, Newark 5, N. J.
MArket 3-7450

Be sure to write today for our new illustrated catalogue.

DANIELS

For further information circle No. 90 on the Reader Service Card

STOP BLISTERING, STREAKING

ON ZINC BASE DIE CASTINGS!

Actual photograph of blistering on zinc die casting cleaned with conventional cleaner.

Designed especially for reverse current electro-cleaning of zinc base die castings prior to electroplating, new Diversey No. 505 completely, safely removes all unwanted deposits! In addition, Diversey No. 505 conditions the surface of the zinc, providing better adhesion between the electro plate and the base metal!

This unique, double-action of Diversey No. 505 helps provide a uniformly clear, brilliantly lustrous finished surface . . . one free from blistering, peeling and streaking! Diversey No. 505 is economical, easy to use and available now! Investigate Diversey No. 505 today! *Mail the coupon for FREE copy of New Bulletin.*

DIVERSEY No. 505

NEW electro-cleaner and surface conditioner!

MAIL THIS COUPON TODAY

THE DIVERSEY CORPORATION
Metal Industry Department
1820 Roscoe Street • Chicago 13, Illinois
In Canada: The Diversey Corporation (Canada) Ltd.
Lakeshore Road, Port Credit, Ontario

THE DIVERSEY CORPORATION
Metal Industry Department
1820 Roscoe Street, Chicago 13, Illinois
Gentlemen:
Please send me complete information, including New Bulletin on Diversey No. 505.

*Name*_____
*Title*_____
*Company*_____
*Address*_____
*City*_____ *State*_____

For further information circle No. 91 on the Reader Service Card

PMM INDUSTRY NEWS

METALS DISINTEGRATING APPOINTS DISTRIBUTOR

Metals Disintegrating Co., Inc., Elizabeth, N. J., has appointed the Roy A. Ribelin Distributing Co. of Houston, Texas, to distribute metal pastes and powders in southeastern Texas. C. M. Buhler, Jr., will be in charge of sales.

WEL-MET APPOINTS ENGINEER

The Wel-Met Co., Kent, Ohio, has announced the appointment of Don S. Urquhart as product engineer. The company is engaged in the manufacture of self-lubricating bearings and structural parts made of metal powders.

THIRD PLANT OPENED BY ARWOOD

Arwood Precision Casting Corp. has increased production capacity 500 percent in the last 18 months, according to William I. Matthes, sales manager of the company. The company's Brooklyn, N. Y. plant was enlarged in June, 1950; a plant in Groton, Conn., began operations in October, 1950; and a plant at Tilton, N. H., has recently started production. The company specializes in the production of investment castings.

ERICKSON ELECTED VICE PRESIDENT

John Wauchope, president of the American Die Casting Co., Grand Rapids, Michigan, has announced the appointment of James L. Erickson as vice president of the company.

HULING PROMOTED AT WESTERN DIE CASTING

E. G. Huling, plant superintendent of the Western Die Casting Co., Emeryville, Cal., has been production manager of the company, according to A. W. Simpson III, president. Mr. Huling succeeds E. J. Basch, who has resigned.

DOW ELECTS PUTNAM VICE PRESIDENT

Dr. Mark E. Putnam has been elected by the board of directors of the Dow Chemical Co., Midland, Mich., to the newly created post of

Announcing . . . a new and complete Die Casting Service that offers

Quality . . . Precision

DIE CASTINGS

from blueprints to finished parts

ALUMINUM . . . ZINC . . . MAGNESIUM

Modern Plant • Latest Type High Pressure Die Casting Machines • Experienced Personnel • Complete Engineering, Machining, Painting, and Plating Departments. Write for bulletin describing complete facilities.

Admiral ADC

DIE CASTING CORPORATION

202 West 83rd Street Chicago 20, Illinois

For further information circle No. 4 on the Reader Service Card

executive vice president of the company. Dr. Putnam, whose service with Dow dates back to 1915, has been a director since 1941 and a vice president since 1942.

LIGHT METAL CASTING MATERIAL

A new aluminum alloy, designated ML, has been developed by the Air Force for use in elevated temperature operations. ML, which includes copper, nickel, magnesium, manganese, chromium, vanadium and titanium as alloying elements, will permit the use of aluminum alloy in parts operating at temperatures of 500 to 600F, rather than the 200 to 300F range of standard aluminum alloys. At 600F, ML will support a load of 6600 psi for 1000 hours, has a maximum tensile strength of 17,300 psi.

GLIDDEN CONSOLIDATES POWDER METAL OPERATION

The Glidden Co. will consolidate all of its powdered metal activities on its 25-acre site in Hammond, Ind., according to Dwight P. Joyce, president. The company's Chemical & Pigment Division, which operates the plant, will increase its production of cuprous oxides, cupric oxides, lead, iron and copper powders, as well as brazing compounds.

In the same announcement, Mr. Joyce disclosed that Glidden has disposed of the secondary metals facilities which are located on part of the Hammond property. These facilities, which included five acres of property, a lead refinery, an office building, and equipment for the production of type metal, babbitt, solder and antimonial lead products, are being operated as the Metals Refining Co., Inc.

SPECTROCHEMICAL MANUFACTURER EXPANDS

A new plant has been completed and occupied by the Applied Research Laboratories, manufacturers of spectrochemical equipment. The new plant, located in Glendale, California, will house the company's Quantometer Instrument Division and will be used for the manufacture of quantometers and source units for production control and industrial research.

TOTAL TUNGSTEN OUTPUT GOES TO DEFENSE JOBS

Almost 100 percent of the tungsten carbide output in the United States is going into essential industrial production, according to a report recently made to the National Production Authority of the U. S. Department of Commerce, by the Tungsten Carbide Manufacturers Industry Advisory Committee.

Although output by the industry has been increased by 50 percent since the outbreak of the Korean hostilities, demand still exceeds supply, according to the report. NPA warned that the supply of tungsten is critically short, with a current operating deficit in this country of 400,000 pounds per month.

Now OFFERING TO INDUSTRY

A Complete Die Casting Service

With the completion of a new plant planned and specifically equipped for the design and building of dies, Tedco offers you a really complete service. We can produce your die castings in quantity and with accuracy. If you desire, we will design your dies, construct them and test them conclusively. Our principals, whose names appear below, pledge their personal attention to your requirements.

The TOOL-DIE ENGINEERING CO., Inc.

C. G. Siefert, President — J. J. Schmader, Vice-President

9210 Loren Avenue — Cleveland 5, Ohio

For further information circle No. 75 on the Reader Service Card

MONARCH ALUMINUM SHIFTS SALES PERSONNEL

Announcement has been made by Russell A. Lawson, sales manager of Monarch Aluminum Mfg. Company, Cleveland, Ohio, of several important shifts in sales-engineering personnel.

Also announced is the occupation, by the Chicago Division sales office, of new quarters at 1166 Diversey Parkway. W. D. Wilkinson is in charge of the office and responsible for sales of aluminum permanent mold, aluminum and zinc die castings in a large area of which Chicago is the hub.

Other shifts in Monarch personnel are: Manley S. Hutchinson, formerly located in the Western New York area is now in charge of the East Coast Division with headquarters in Lake Mohawk, N. J.

Jack Schriner, former Cleveland salesman has been transferred to the Western N. Y.—N. W. Pennsylvania territory and will maintain headquarters in Buffalo, N. Y. Harold Marsh, in charge of the south-central division has moved headquarters from Canton to Columbus, Ohio.

Joseph Shrier, new member of the organization, has succeeded Mr. Schriner as Cleveland area representative and will work out of the executive offices. Robert Lorenz, has been employed to assist Walter V. Tracy, sales office manager.

METAL POWDERS For—
Chemicals, Cosmetics, Corrosion-Resistant Parts, Electrical Parts, Magnets, Bearings, Pyrotechnics, Thermit Reactions, Pressed Parts, Locks, Hardware, Filters, Chemical Formulations, Special Alloys, Low Temperature Lubricants, Motor Generator Brushes, Contacts, Friction Materials, Electrodes, Machine Parts, Brazing, Fungicides, Synthetic Rubber, Protective Coatings, Ammunition, Loaded Greases, Rubber Products, Welding Rod Coatings, High Temperature Soldering, Automobile and Truck Bodies, Coated Steel-Backed Bearings, Mechanical Rubber Goods, etc.

. . . but, MD's 35-year background in Metal Powder production, research and development adequately qualifies and assures you of thorough experienced advice in obtaining the utmost utilization from the many advances in the field of Powder Metallurgy.

Therefore, do not be misled. Avail yourself of the best. Take your problems to Metal Powder Headquarters.

***

METALS DISINTEGRATING COMPANY, INC.
Elizabeth 8 • New Jersey
Plants: Elizabeth, N. J., Manchester, N. H., Berkeley, Calif., Emeryville, Calif.
SUBSIDIARY OF AMERICAN-MARIETTA COMPANY

1916 MD POWDERS Since 1916
METAL POWDERS
METAL PIGMENTS
METAL ABRASIVES
WORLD'S LARGEST MANUFACTURER OF FINELY DIVIDED METALS

For further information circle No. 46 on the Reader Service Card

SINTERED BEARING LIST
continued from page 43

to the forces resulting from the plastic deformation of dies and relative die segment movement during the pressing operation. The importance of establishing a standard method for the determination of this property as it applies to compacted but unsintered metal powders has long been recognized by industry. Several methods have been developed for determining green strength; however, none have heretofore gained universal acceptance.

In an effort to unify and coordinate industrial practice the Metal Powder Association prepared a standard designated 15-51T which describes a method for the determination of green strength and reflects the practice most commonly used by metal powders producers and consumers.

The method covers two testing procedures: (1) The Rattler test which specifically determines the abrasion resistance and edge stability of an unsintered, processed metal powder specimen under controlled conditons and (2) the Transverse Rupture test which specifically determines the transverse strength of a similar specimen by subjecting it to a uniformly increasing transverse loading. The standard provides sufficient descriptive detail and drawings of all apparatus involved to enable the user to construct his own apparatus.

Copies of the new standards may be obtained at 25c per copy by writing to the Metal Powder Association, 420 Lexington Avenue, New York 17, New York.

WORLD METAL CONGRESS MEETS; 35,000 EXPECTED

DEFENSE CHIEF C. E. WILSON TO ADDRESS MAJOR SESSION

Defense Mobilizer Charles E. Wilson has accepted the invitation of the American Society of Metals, 7301 Euclid Avenue, to be the major speaker at the closing session of the World Metallurgical Congress in Detroit on October 19.

William H. Eisenman, the Society's Executive Secretary, said Wilson will speak on the strategic importance of world metal conservation and production to the interests of free world defense.

The Metallurgical Congress is sponsored by the American Society for Metals and will be the first world meeting of metal specialists and production chiefs. It will be the largest industrial gathering ever held. More than 35,000 persons are expected to attend.

The Wilson meeting will be staged in the Statler Hotel at 6 P.M. for foreign representatives and their American counterparts. Each individual of other nations, attending the Congress has been assigned an American host. Eisenman estimated that about 800 persons are expected at the final dinner meeting.

EUROPEAN MISSION TO ATTEND MEETINGS

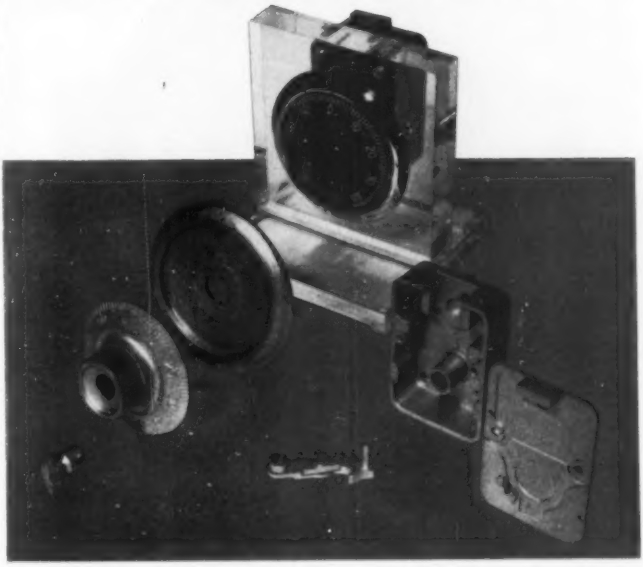
The Economic Cooperation Administration and the Organization for European Economic Cooperation have contracted to sponsor three more "technical assistance missions" for inclusion at the World Metallurgical Congress in Detroit October 14-19.

More than 400 E.C.A. and non-E.C.A. metallurgists from 21 nations now are expected in Detroit. The Society already has arranged "Study Tours" of American industry which will carry 200 of these visitors through 57 cities and 13 states prior to the Congress with expenses and sponsorship shared by E.C.A. authorities.

According to William H. Eisenman, ASM Executive Secretary, the three additional governmental groups will specialize in (1) nonferrous heavy metal fabrication, (2) galvanizing techniques and (3) nonferrous smelting and refining operations. Following the Detroit meeting, these Congress "conferees" will spend four weeks touring industrial sites, just as the others, divided into eight groups according to specialty, will journey for four weeks prior to the Detroit conclave.

The three post-Congress tours are being arranged under E.C.A. by Comdr. W.H.G. Fitzgerald (USNR), Vice President of the Metallurgical Research and Development Company, Washington, D. C.

IT TAKES THE RIGHT COMBINATION . . .



The secret combination that *opens* this lock can't be detected by burglars because there is no telltale "click" . . .

. . . But there is no secret about the right combination to *build* this outstanding lock.

It took the experience of Accurate's die makers, the skill of Accurate's casting department and the good judgement of Accurate's management to turn out these close-dimensioned, finely detailed components at a reasonable cost.

Let Accurate engineers suggest ways to save money on your product.

ALUMINUM • ZINC • MAGNESIUM DIE CASTINGS

ACCURATE DIE CASTING CO.

3089 E. 80TH STREET • CLEVELAND 4, OHIO

For further information circle No. 2 on the Reader Service Card

METALS DISINTEGRATING CO. WILL HONOR 35 FOR WORK IN POWDER METALLURGY

AS a climax to their 35th anniversary celebration, The Metals Disintegrating Co. is sponsoring a dinner during the week of the National Metals Congress in Detroit. Feature of this dinner will be honoring of 35 men who, in the company's opinion, have done the most to further the interests of the powder metallurgy industry.

The dinner Tuesday evening, October 16, will be attended by 150 invited guests from industry.

This occasion which accentuates the rapid growth of the powdered metal industry, has brought to the minds of many "old timers" in the field, the career of Professor J. E. Hall who has often been called the "father" of powder metallurgy in this country.

Prof. Hall started out to be an engineer studying at Stevens Institute of Technology.

After leaving Stevens, young Hall worked for about a year for a company manufacturing paints and pigments and then accepted a position as laboratory assistant in assaying at Columbia School of Mines, remaining at Columbia as professor of assaying and executive officer of the School of Mines until his death in 1931 at the age of 53.

PROF. J. E. HALL

Prof. Hall's first venture into what has since become powder metallurgy was in 1916 with the organization of The Metals Disintegrating Co. At that time, the first world war shut off the supply of zinc dust, an urgently needed material in the precious metals extraction field. The method developed by Hall produced a zinc dust of such excellence that it became and has remained, the standard dust of the industry. Shortly afterwards Hall entered the aluminum powder manufacturing field to supply the English Government with aluminum powder, a needed armament material. In late 1919 the plant was established at its present location in Elizabeth, N. J.

In 1921, Prof. Hall working with the then Dayton Engineering Laboratories and later with a similar group at Bound Brook, helped to develop

Handle, Body & Cover for Air Controller Valve Assembly

ANOTHER
"Cleveland"
PRECISION DIE CASTING

We cannot stress too often the big part **service** plays in the operation of our plant — close co-operation with your engineers, accuracy in meeting your requirements and every effort to fill delivery request.

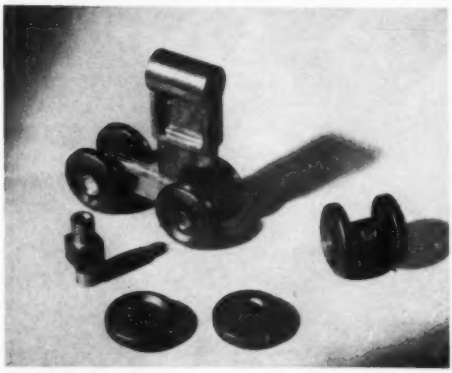
REMEMBER—EVERY "CLEVELAND" JOB IS IMPORTANT.

DIE CASTING DIVISION
The Cleveland Hardware & Forging Co.
Established 1881
3256 E. 79 ST. CLEVELAND 4, OHIO

For further information circle No. 24 on the Reader Service Card

SIMPLIFIED SOLUTIONS

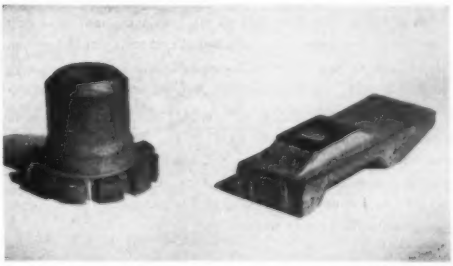
for production problems



QUIET OPERATION AND LOW COST ASSEMBLY feature this door hanger assembly. The assembly represents a combination of a zinc die casting made by Federal Die Casting Corp. and powdered iron wheels. Quiet long life operation comes through the use of the powdered iron wheels impregnated with oil to give life long lubrication. The rivet pins are integrally cast with the hanger part and a simple spinning operation fastens the wheels to the die casting.

CAST IN BRASS by the Universal Casting Corp., this brush holder is a good example of the precise casting and good finish that can be obtained by plaster mold casting. Except for removal of the gate and a slight amount of deburring, this plaster mold casting is ready for use in the as cast condition. Formerly a sand casting the change to plaster mold casting has shown a material reduction in cost by the elimination of surface machining and lowered number of rejects.

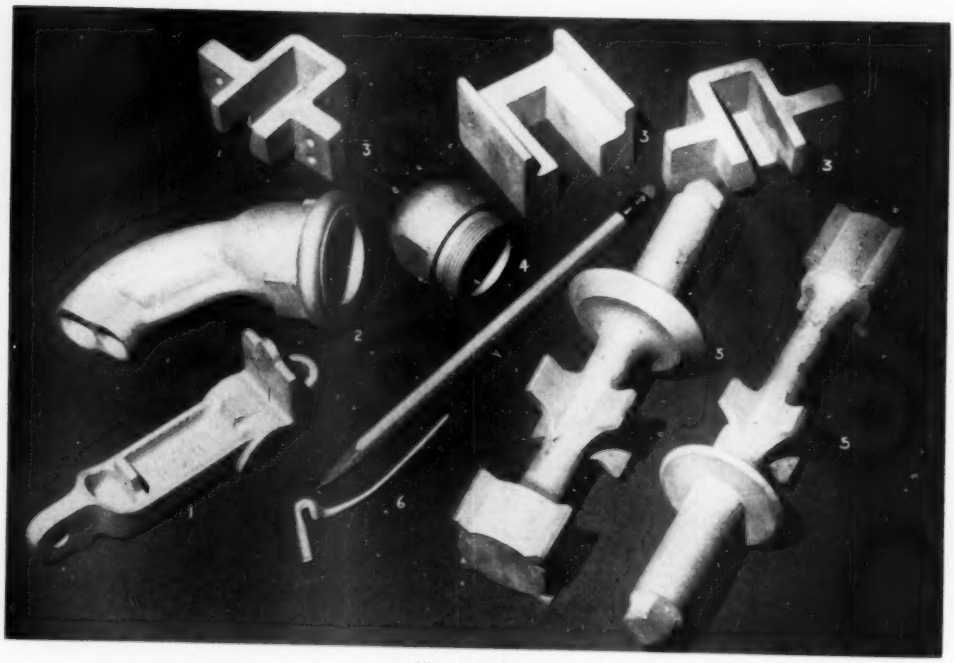
TINY PARTS FOR TOYS and novelties require highly intricate surface detail, which, when coupled with small size, represent a real production problem. However, Gries Reproducer Corporation turns out these parts by the hundreds of thousands by die casting them. Pieces illustrated comprise a jackstone, chicken foot, cap pistol trigger and locomotive cross head, all in zinc alloy.



SAVING OF 50 PERCENT over previous gray iron sand castings is reported for these two door closer parts produced by powder metallurgy. Both pieces are manufactured by the Wel-Met Co. Quiet operation, an important feature of such equipment, is readily obtained by the use of these self-lubricating parts which have been made with controlled porosity. They are oil impregnated after sintering to give self lubrication for the life of the parts.

SIMPLIFIED SOLUTIONS

for production problems



All castings by International Nickel Corp. Photo courtesy INCO Magazine.

1. REPLACING A SAND CASTING which had to be machined all over, these carbon jaws for motion-picture projectors are now investment cast in silicon nickel. The investment cast jaws have shown a life of five times that of the previously used sand cast alloy and at the same time a fabricating cost saving of 15 percent.

2. STAINLESS STEEL BLOW PIPE HEAD investment is cast in 18 percent chromium 8 percent nickel alloy. Previously sand cast and hard surfaced with Stellite, this blow pipe head now shows improved heat and corrosion resistance. Conversion to a stainless steel investment casting reduced the per piece cost in quantities of only 1000 by 36 percent.

3. BY INVESTMENT CASTING of "S" Monel these laundry machine wedges and latches have shown a marked saving in manufacturing cost. Previously made by forging and machining, the latches are now investment cast at a saving of 10 percent and the wedges at a saving of 16 percent. Good resistance to ware and corrosion are assured by the alloy used.

4. A REDUCTION IN THE NUMBER OF PIECES used per assembly was accomplished by converting to investment castings for this oil furnace atomizer nozzle. Previously made by sand casting, machining and assembling four parts, the nozzle is now made up of three investment castings at a saving of 27 percent in the manufacturing cost.

5. RAILROAD TANK CAR valve stems are now investment cast in Monel. Replacing either machined sand castings or stems machined from bar stock, these investment castings have shown a saving of 47 percent in cost. Adequate corrosion resistance is assured by the use of Monel metal.

6. A PICK-UP FINGER FOR a new spinning reel is made possible by investment casting of "H" Monel. The complex machining required by any other production method made costs prohibitive. The alloy used gives strength and corrosion resistance for this part frequently under water.

HONOR 35
continued from page 80

the so-called oilless bearing. The results of this work necessitated a source of copper powder other than pigment grade and Prof. Hall set up the first plant for the manufacture of copper powder by the oxide reduction process.

From these beginnings came the Metais Disintegrating Co. of Elizabeth, N.J. which has grown to be a major supplier of metal powders for industry.

Other of Prof. Hall's contributions are the introduction to the General Electric Co. of cemented tungsten carbides as manufactured in Germany. He worked with Dr. Fink on chromium plating, developed the present method utilized in the manufacture of "Bundy" tubing, and did development work on the copper-carbon brushes making, it might be added, other markets for copper powders.

POROSITY PROBLEM REDUCED
continued from page 35

cast part requires only tapping, turning the outside diameter of the shoulders and a finish cut on the interior of the body to give it a burnished finish.

The part number and the arrow indicating the direction of flow are cast integrally with the valve body. The name plate is fastened to the part by drive screws. Holes are cored in the casting for these screws.

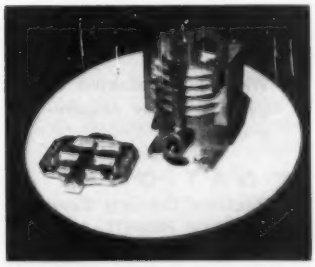
The acceptance of these valves by industry and the much lower manufacturing costs that resulted from the change to die casting as a method of valve body fabrication were major factors in the company's decision to use die castings in their new solenoid-operated valve.

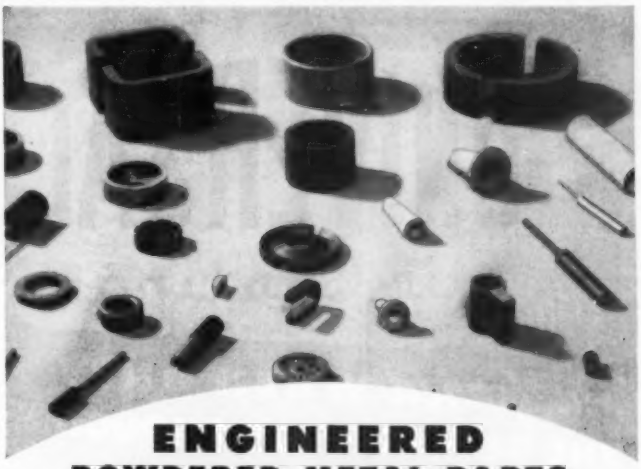
The valve is a 2-way and 3-way pilot valve for air, oil and water with pressures up to 200 psi. The plunger moves up when the solenoid is energized, and is returned by a spring when the solenoid circuit is opened.

Machining on these parts has been kept to an absolute minimum. On the body, three ports, four holes in the top for attaching the cover and a port for the conduit fitting are tapped. No machining is necessary on the cover.

The body is well ribbed for strength. Four heavy vertical bosses are formed

2. SUCCESS WITH THEIR FIRST USE OF DIE CASTINGS led to this more complex valve housing produced as zinc die casting. Newest product in the company line is this 2-way and 3-way pilot valve for air.





ENGINEERED
POWDERED METAL PARTS

- MAGNETIC CORES
- MECHANICAL PARTS
- ORDNANCE PARTS
- PERMANENT MAGNETS
- POROUS FILTERS

The Engineering Department of Radio Cores, Inc. is always willing to appraise the adaptability of a given part to powder metal processing.

Our Engineering Department is experienced in all phases of powder metallurgy — in the design, use, and application of Electronic or Magnetic Cores — Mechanical Parts — Ordnance Parts — Permanent Magnets — Porous Filters. Experienced metallurgists, electrical engineers, mechanical engineers, application engineers, together with a wealth of manufacturing experience, comprise a combination hard to beat in the powder metallurgy field — and one which assures our customers of properly designed and applied parts.

Write for brochure and data sheets.

RADIO CORES INC

RADIO CORES, INC.
9550 TULLEY AVE. • OAK LAWN, ILLINOIS
(ADJOINING CHICAGO)

For further information circle No. 104 on the Reader Service Card

on the body, and five horizontal fins add to the radial strength while dissipating heat generated by the solenoid. The cover is also ribbed to give maximum strength with minimum sectional thickness.

The cover incorporates a boss which also has a functional purpose. This boss is hollow and carries air from the centered section of the valve body to the exhaust port: A counterbore is cored at one end to accommodate a welch plug which seals off the opening. At the other end of the cored hole, another counterbore is cored to hold an O-ring seal.

The design was planned to facilitate the assembly operation. Inside the valve body two bosses are cast to locate the armature section. These bosses hold the armature in place without fasteners. In the base of the valve body a recess is cored out to hold an O-ring packer.

OPPORTUNITIES

MIDWEST DIE CASTING SALES and engineering representation firm with representatives located in all principal midwest cities desires connection with aluminum die casting concern. Please reply Box 10151, Precision Metal Molding Magazine.

WORKS MANAGER WANTED Western Michigan concern desires man thoroughly experienced in organic finishing of die castings. This is excellent permanent position at top salary for qualified man. State educational and business background. Box 10251, Precision Metal Molding Magazine.

UNIVERSAL
Die Castings

Preferred WHEN ONLY THE BEST IS GOOD ENOUGH

There must be a reason why so many highly discriminating manufacturers entrust *all* of their work to us. The reason is they know from experience that the finished job will meet every specification as to appearance, strength, accuracy and function. Furthermore, the price on either long or short runs is in line with their production and selling costs.

If you are located west of the Mississippi River we are in an excellent position to take care of your die casting requirements. Quotations made promptly.

UNIVERSAL
DIE CASTING COMPANY
5001-05 SANTA FE AVE. • LOS ANGELES 11, CALIF. • TELEPHONE: KIMBALL 7264

For further information circle No. 77 on the Reader Service Card

NATIONAL

Our newly added plant and facilities give us the capacity to help you with your defense orders.

INVESTMENT CASTINGS

Ferrous and non-ferrous alloys.

We will be pleased to quote on your requirements.

NATIONAL
Precision Casting Corp.
CLIFTON HEIGHTS, PA.

Circle No. 56 on the Reader Service Card

continued from page 41

into five one-inch sections, each cast to a tolerance of .003. By manual adjustment of the five pieces during assembly, it is possible to hold the cumulative tolerances within limits.

It should be noticed that the face of these computer bars is not flat, but has a concave surface which must also be accurately controlled because a needle indicator moves back and forth this surface in an arc, and must make perfect contact at all points.

To help in avoiding warpage or excess shrinkage, the back of the castings are cored out. The only machining on this stainless steel unit is to drill and tap two assembly holes.

Complex frames and mounting brackets are die cast in aluminum.

A type of complex shape which also has the requirement of multiple dimensional relationships in all planes, is this main frame for the Flexowriter. All but one major assembly is mounted on this piece, and upon its accuracy and dimensional stability during service, depends much of the machine's smooth performance.

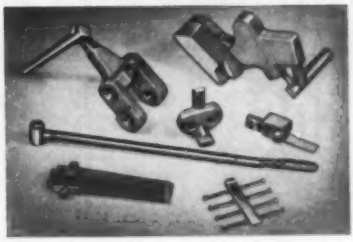
Because of the large number of critical dimensions, the cost of sand casting plus machining would be exorbitant. While there remains considerable machining on the die cast aluminum piece, most of it is in the nature of light stock removal such as milling off a draft to establish perpendicular surface relationships.

This die casting, produced by the Doehler-Jarvis Corp., is typical of a group of mounting elements which are produced by die casting. Most of them are simpler in form, but all do a similar job of mounting, aligning and relating various subassemblies.

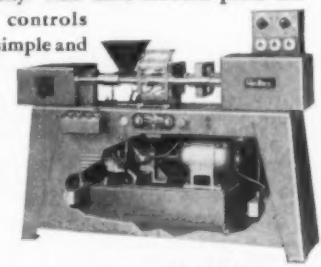
continued on page 86

Investment Casters Prefer
VAN DORNS for
molding styrene patterns

Typical precision parts produced by investment casting, using styrene patterns molded to .003" tolerances on Van Dorn Presses.



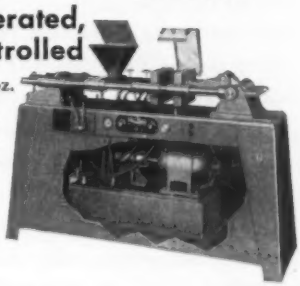
Semi-Automatic Injection Press —2-oz. capacity. This ultra-modern press has push-button controls that are safe, simple and convenient. Accurate temperature regulation. Ruggedly built, compact and quiet.



MODEL H-200

Power-Operated, Lever-Controlled Presses — 2-oz. or 1-oz. models. Have many automatic and safety features.

MODEL H-200



Plastic Grinder — grinds up waste, rejects, etc., for re-use.

MODEL G-100

Mold Bases for these presses available from stock.

Write for information on this equipment.

THE VAN DORN IRON WORKS CO.
Cable Address: "VANDORN" Cleveland
2693 East 79th Street · Cleveland 4, Ohio, U. S. A.

For further information circle No. 78 on the Reader Service Card

3 Times Stronger 90% Lower Cost

HERE is an outstanding example of what an Arwood precision investment casting can do.

This is a justifying cam used in a business machine and it was originally designed as a series of 18 stampings to be assembled by pinning and brazing. In its manufacture, Arwood was able to show a savings of 90% and at the same time triple the strength and wear-resistance of the cam. No hand filing or fitting is required in assembling the cast parts and all are completely interchangeable.

Perhaps you have a production problem that Arwood can help you solve. Our engineers, with years of experience in many industries, often are able to make valuable suggestions that result in important savings in manufacturing.

For more complete information about the accuracy, the lower costs and the versatility of precision casting, write for our booklet, "A Critical Survey of Investment Castings."

ARWOOD

PRECISION CASTING CORP.

72 WASHINGTON STREET • BROOKLYN 1, N. Y.

Plants: Brooklyn, N. Y., Groton, Conn., Tilton, N. H.

For further information circle No. 15 on the Reader Service Card

Narrow slot for water feed is cored in investment casting and swaged.

The blade which feeds water onto the envelope flaps in the MultiSealer is part of a patented pressure water feed which gives positive sealing and constant cleanliness.

This blade is produced as an investment casting in beryllium copper because it is the only way the thin, lightweight piece could be produced with smooth as-cast surfaces in an alloy which will resist corrosion from

the glues and adhesives with which it comes in contact in the presence of water.

Original specifications call for a tapered water slot from .005 at the input end to .012 at the far end. This is needed to give a uniform flow of water across the entire length of the sealer. The investment caster couldn't core the slot to dimension, but provides a .020 slot which is subsequently swaged to the correct width.

COMBINATION LOCK PARTS

continued from page 50

foiling manipulation even with the aid of electronic listening devices.

The OD of the wheel tumblers has 150 evenly spaced teeth cut into it. The "fence" on the lever also has matching teeth cut on the surface facing the tumblers. Thus, when an unauthorized person, without prior knowledge of the combination, tries to manipulate the lock and dials the wrong combination, the matching teeth in the tumblers and lever engage to prevent "walking" the tumblers. The combination must be dialed exactly, so that anything further than half a number away fails to operate.

These combination locks are available in single or dual control. Single control is afforded by the use of

the knob whereas dual control is attained by use of the key which allows one user to possess the key and the other user the combination, thereby making it impossible for either user to open the safe or cabinet without the presence of the other.

Retraction of the slide bolt through use of the key or knob without knowledge of the combination renders the dial inoperative through stop lugs cast as an integral part of the die cast cover, thus foiling manipulation of the lock.

In the event that extreme force were to be used to smash the lock to gain entry, "weakening slots" are provided inside the die cast housing which would allow it to collapse in such a way as to jam the lock and prevent it from opening.

In addition, the lock has a special feature which allows the user to change the combination at any time. Thus, if someone else were to discover the combination, the combination could immediately be changed to prevent unauthorized admission. There are 1,000,000 theoretical combination changes of three numbers each, allowing the user to change the combination as often as he pleases and offering a wide scope of combinations from which to choose.

RUBBER OR METAL MOLDS

continued from page 54

Several advantages of the rubber molds include the speed and low cost of making them. A rubber mold can be made in a matter of two hours from an original pattern. For short runs, for duplication of complex machined parts or for long runs where dimensional control is not essential (such as the fishing rod lopps) rubber molds have an important place.

Longer mold life is obtained from metal molds, although satisfactory rubber mold life, plus low cost of mold replacement, are also to be considered.

Essential for successful use of alternative types of molds are close temperature control and accurate pressure control to give uniform waxes free of shrinkage.

Molds are held in the hand and pressed against the injector nozzle. Rubber molds are powdered with talcum to give good pattern surface and help release, whereas metal molds employ a mineral oil release coating.

If you are "PINCHED"
We have the "SHOEHORN"

TO "EASE" YOUR
PRODUCTION
PROBLEMS

Yes, you'll discover that production costs can be lowered and production problems minimized through the use of die cast magnesium and aluminum alloys. These new lightweight, yet tough, metals also greatly decrease the weight of your products. Through die casting, greater scope is offered for carrying out the designers' ideas—more freedom of design is allowed.

LITEMETAL DIECAST, INC. is an organization of specialists—men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs—little machines for little jobs . . . the right sizes and types of the most modern die casting equipment. Our facilities are complete for producing parts from the size of a button to large cable spools.

***Remember*, even comparatively simple dies can be used to die cast parts at lowest cost conditions and great savings can also be made in labor formerly required for machining and finishing.**

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST Inc.
A DIVISION OF HAYES INDUSTRIES
1925 WILDWOOD AVE · JACKSON, MICHIGAN
PLANT AND EXECUTIVE OFFICES

For further information circle No. 41 on the Reader Service Card

Die Castings by **FEDERAL**

FEDERAL-Built dies and high pressure casting equipment with water hydraulic injection assure **GREATER DENSITY and BETTER FINISH.**

ALUMINUM BAKING PAN
approx. size 2" x 7" x 10"
Made in Cold Chamber Machines.

Advanced technique, modern equipment and mechanical skill enable FEDERAL to offer a complete precision die casting service in *Aluminum and Zinc Alloys.*

FEDERAL DIE CASTING CO.
2220 N. ELSTON AVE. CHICAGO 14, ILL.
PHONE ARMITAGE 6-4803

For further information circle No. 26 on the Reader Service Card

This Booklet Explains Why We Merit Consideration For Your Defense DIE CASTINGS

we're geared for your defense needs

ADVANCE TOOL & DIE CASTING COMPANY

Please send for a copy today!

ADVANCE TOOL and DIE CASTING CO.
3764 NORTH HOLTON STREET
MILWAUKEE 12, WISCONSIN

For Further information circle No. 5 on the Reader Service Card

NON-FERROUS ALLOYS
continued from page 39

running from ± .005 to ± .010 per inch on one side of the parting line. On dimensions which cross the parting line, the tolerances are higher. where a hole or recess occurs in the casting, a draft of ± .005 to ± .010 per inch, depending on design, is required. Holes are cast ready for tapping or reaming.

Almost any combination of copper, tin, lead and zinc that has a lead content of no more than 1.5 per cent and a pouring temperature that does not exceed 2300 F. can be cast in the standard plaster molds. The following alloys are in current production:

ALUMINUM — A silicon-aluminum alloy whose fluidity in combination with the insulating qualities of the mold produces accurate, thin-sectioned castings. Its clean, smooth surface has no skin-hardness, it is easily plated, and can be machined to close tolerances with a minimum of annealing. It is useful where strength is not of prime importance.

ALUMINUM (high strength) — Developed primarily for use in plaster molds, it includes seven to nine percent zinc and casts with fine detail, uniform structure and high resistance to corrosion. It is used for communication, instrument and pump parts, aircraft fittings, pistons, cylinder heads, torque converters, impellers and other high strength applications.

ALUMINUM BRONZE — A strong, tight, zinc-free alloy that has excellent wearing characteristics as well as fine machinability. It is lighter in weight than steel and most other copper-base alloys, yet combines the strength and ductility of steel with a high resistance to corrosion. It is used for gears, sprockets, control levers, bearings, marine equipment, acid resisting pump parts, wing nuts, universal joints, and other parts that must maintain strength and ductility at high temperatures.

BERYLLIUM COPPER — A non-sparking, non-magnetic copper-base alloy that has high fatigue resistance. Through various heat treatments, it can attain physical properties equal to the highest grade steels. It is used for non-sparking tools.

BRASS—A copper-zinc alloy that is remarkable for its tensile strength, yield point, toughness, uniformity of texture, and superior fatigue resisting properties. It lends itself well to polishing and plating. It is used for brush holders, gears, levers, bearing retainers, control mechanisms, hardware fittings, brackets, plaques and machine parts.

MANGANESE BRONZE — A copper-zinc alloy containing aluminum, manganese, iron and tin. It is resistant to sea water and other corroding agents, and has excellent physical properties, the as-cast strength being stronger than many steels. It is used for gears, valve bodies, electrical mechanisms, clip fasteners, levers and marine equipment.

NICKEL ALUMINUM BRONZE —Essentially an aluminum bronze with the addition of nickel. It combines corrosion resistance, high strength and excellent wearing characteristics. It is used for gears, sprockets, bearings and marine equipment.

NICKEL SILVER — Contains 21-23 percent nickel. It has excellent casting qualities, is very dense, and is easily polished to a satin white or mirror finish. It is used for food and dairy parts.

SILICON BRONZE — A high copper-silicon alloy containing small quantities of aluminum and iron. It has excellent corrosion resistant, mechanical and wearing qualities. It is used for pole line hardware, cable clamps and electrical connectors.

1. Registered U. S. Patent Office. This process was developed and is controlled by Castings Patent Co., 11 S. LaSalle St., Chicago 3, Ill.

2. Atlantic Casting & Engineering Corp., Clifton, N. J. has standardized on molds that produce castings up to 17.5 in. long, 11.5 in. wide and, if castings are symmetrical, 3 in. deep. If not symmetrical, maximum depth from one side of the parting line is 2 in.

Universal Castings Corp., Chicago 38, Ill., uses a flask 18 in. long, 10 in. wide and 2½ in. deep on each side of the parting line. They also have an auxiliary line produced in flasks 20 in. x 12 in. x 3½ in. each side of the parting line. For some purposes, flasks 24 in. x 24 in. x 4½ in. across the parting line are used.

CUTS DIE CASTING COSTS

THE LOW COST —HIGH SPEED A.B.C. DIE CASTER

● Get economical high speed production of extremely accurate lead, tin and zinc alloy die castings of ONE POUND or less with the new A.B.C. die caster. Here's a money saving die casting machine which eliminates the costly production of small die castings on large die casting machines.

The A.B.C. is easy to set up and operate. Its lightning production speed makes inexpensive single cavity molds practical and profitable. Its rugged construction insures trouble-free, efficient operation.

Write today for complete details in Bulletin PMM-9.

Standard equipment includes:

- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
- DIE BLOCKS
- AIR REGULATOR
- FILTER
- OILER
- SAFTEY SHOT INTERLOCK

Visit our booth G 127 at the National Metal Exposition

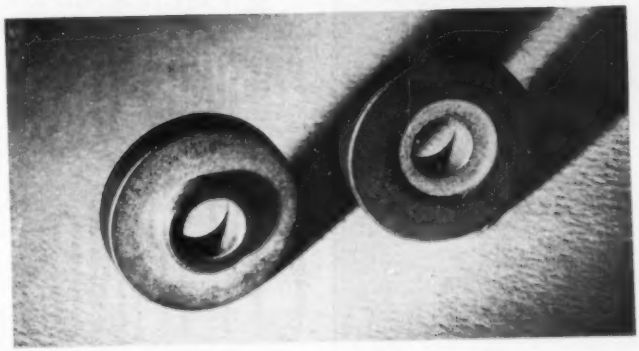
A B C

DIE CASTING MACHINE COMPANY

339 W. 112TH PLACE • CHICAGO 28, ILL.

For further information circle No. 1 on the Reader Service Card

Powder Metal Parts Like These...



SAVE MONEY... MAINTAIN PRODUCTION

Shown above are powdered iron rollers which are used in file cabinets. Steel ball bearings were formerly used. Not only has the porous iron bearing provided a quieter, freer moving drawer but the price of this part is considerably lower than a ball bearing. International Power Metallurgy Co. would like to help you with your powder metal design problems.

THE POWDER METALLURGY ENGINEERS HANDBOOK IS AVAILABLE TO YOU. SEND FOR A COPY ON YOUR COMPANY'S LETTERHEAD.

IPM

International Powder Metallurgy Co.

439 W. MAIN STREET • RIDGWAY, PENNSYLVANIA

For further information circle No. 35 on the Reader Service Card

DIE CASTINGS by Stewart

41 years of service to Industry!

Designing

•

Engineering

•

Die Making

•

Metallurgical Control

•

Most modern Die Casting Equipment

•

Complete machining, polishing and assembly facilities

We invite inquiries concerning all Die Casting problems

STEWART DIE CASTING

Division of
Stewart-Warner Corporation

4533 Fullerton Ave., Chicago 39, Ill.
38 Austin St., Bridgeport, Conn.

Circle No. 70 on the Reader Service Card

Our Customers Say:

"We have found HENNING to be our best source of supply for ZAMAK DIE CASTING ALLOYS"

(ZINC BASE)

A trial will convince you, too. Remember the name — HENNING. It means absolute satisfaction.

Phone
HYacinth 7-3470

HENNING BROS. & SMITH INC.
95 SCOTT AVE., BROOKLYN 6, NEW YORK

HB&S HB&S HB&S HB&S

For further information circle No. 31 on the Reader Service Card

WHETHER YOUR REQUIREMENTS ARE FOR

CASTINGS THAT ARE BIG or CASTINGS THAT ARE SMALL

There is no better source of supply in the Midwest than

STROH

DIE MOULDED CASTING CO.
525 E. MICHIGAN ST., MILWAUKEE 2, WIS.
Since 1903

For further information circle No. 71 on the Reader Service Card

INFILTRATION POWDER METALLURGY:
what it offers the designer of high density parts

DR. CLAUS G. GOETZEL*

A REMARKABLE contribution to the steady advancement of industry and science is being made today by powder metallurgy. Its field of application has increased considerably during the last decade alone. To the impressive roster of well established powder metallurgy products such as incandescent lamp filaments, cemented carbide hard metal cutting end forming tools, metal-bonded diamond tools, contact materials, self lubricating bearings and high frequency cores have been added steel parts, permanent magnets, metallic friction devices, filters, high temperature high strength alloys. More recently certainly military applications such as rotating bands, jet engine compressor blades, and a variety of electronic parts have been made from metal powders.

The volume of parts being made or contemplated can best be indicated by the estimate of 10 million pounds of powder per month for one of these items alone.

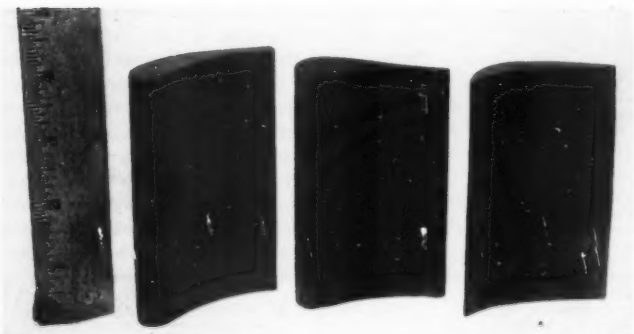
THE POWDER METALLURGY PROCESS

From this account of the more important uses of powder metallurgy products today, it is obvious that the basic process used to produce these items must be highly flexible.

The powdered starting material is actually the only fundamental factor common to all types of end products created. However, the term "metal powder" constitutes somewhat of a simplification. For example, a finely dispersed, near colloidal mass of tungsten particles as used for filaments and hard metal man-

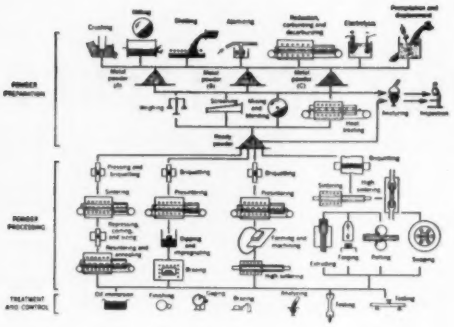
*Vice-president and director of research, Sintercast Corporation of America, Yonkers, N. Y.

Jet Turbine Vanes: Important use of Infiltration

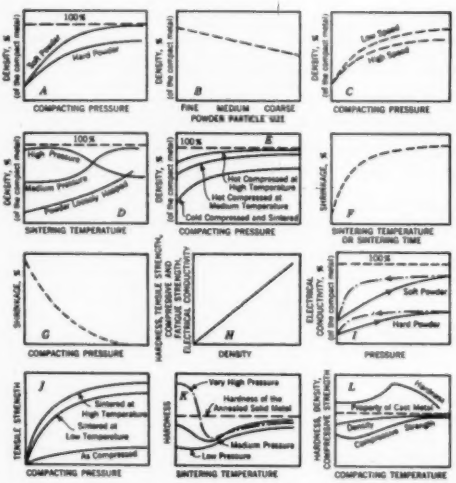


Turbo-jet blade nozzle vanes made by infiltration metallurgy. Titanium carbide pressed and sintered, **left**, to form a skeleton. The infiltrated vane after filling the pores in the titanium carbide skeleton with copper, **center and right.**

Flow chart of different powder metallurgy techniques:



Changes in physical properties of metal powder compacts brought about by process variables:



2 *A: Effect of the powder plasticity on the relation between density and compacting pressure. B: Relation between density and initial particle size. C: Effect of speed of pressing on the relation between density and compacting pressure. D: Effect of the order of magnitude of the pressure on the relation between the final density and the sintering temperature. E: Effect of the mode of pressing and processing on the relation between density and compacting pressure. F: Relation between shrinkage and sintering temperature or time. G: Relation between shrinkage and initial compacting pressure. H: Relation between density and such physical properties as hardness, tensile strength, compressive strength, fatigue strength, and electrical conductivity. I: Effect of the powder plasticity on the relation between electrical conductivity and compacting pressure. J: Effect of sintering temperature on the relation between tensile strength and compacting pressure. K: Effect of the order of magnitude of the pressure on the relation between hardness and sintering temperature. L: Relation between hot-pressing temperature and such physical properties as hardness, compressive strength, and density.*

ufacture, has little in common with a mass of evenly sized nearly spherical brass or bronze particles used in the manufacture of filters and diaphragms.

Thus, the ultimate purpose controls the characteristics of the powder wherever nature permits. Limitations are encountered in size, shape and structure. The behavior under pressure or heat bear its imprint on the processing and properties of the powder. In certain instances these limitations make the production of a part difficult or impossible. Under these conditions resort must be made to other manufacturing processes or the design must be changed.

It may logically be expected that vastly different powders require different processes of forming into a product. The end-product, too, determines the specific steps of manufacture and control.

For example, the previously mentioned spherical, coarse-granular, particle type bronze powder would offer considerable resistance to compaction when pressed. Very high pressures and strongly reinforced dies would be required for the molding of a dense body. However, the smooth surface contours of the powder causes a minimum of friction against a fluid passing through the interstices of the particle mass. The near equal particle size gives excellent permeability.

Therefore, such powder is a most suitable one for porous filter bodies and controlled permeability products, because their fabrication does not require high forming pressures.

On the other hand the ultra fine tungsten powder previously mentioned would be completely unsuited for the production of porous structures. The rough, spongy surface of the particles would tend to intertwine the particles during mold filling and pressing in such a manner that the interstices and pores would be multitudinous but not interconnected. The result would be a sharp drop in the permeability to fluids.

This very characteristic of dense packing of the powder is an advantage in pressing wire bars. When sintered at a temperature approaching the melting point of the metal a fully dense body can be made by subsequent swaging and wire drawing.

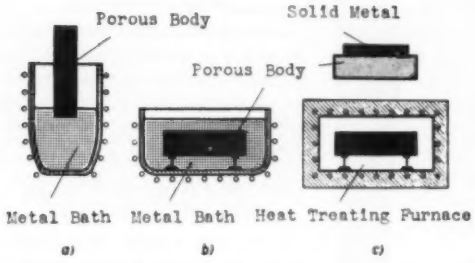
Extensive experimental work has resulted in many new applications of powder metallurgy products. Often as a result of temporary expedients, interesting new procedures have been devised. The step of presintering iron-graphite compacts below the bulk diffusion temperature of the carbon avoided excessive pearlite formation and lead to the large scale production of sintered steel parts at lowered cost due to reduction of the forming pressures required. Many other examples of similar nature could be recited.

THE PRINCIPAL POWDER METALLURGY TECHNIQUES

Basically, there are four methods of processing metal powders into a finished product:

1. Metal powders are simply heaped in a vessel, while protected by a neutral or reducing atmosphere,

3. Principal methods of infiltration:

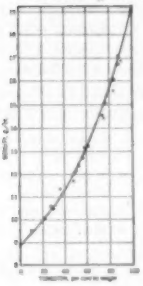


Capillary Dip-Infiltration: Infiltration by immersion of a small section of the skeleton body in the metal bath.

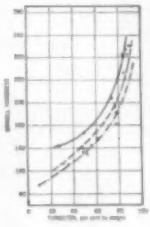
Full Dip-Infiltration: Infiltration by complete immersion of the skeleton body.

Contact-Infiltration: Infiltration by penetration of the molten metal initially in juxtaposition with the skeleton as solid metal.

4. Effect of composition on density of Tungsten-Copper Alloys
(according to Kieffer and Hotop)



5. Effect of composition on hardness of Tungsten-Copper Alloys
(according to Kieffer and Hotop)



and subjected to heat insufficient to cause complete melting. This procedure is generally referred to as thermal sintering and is used in the production of metallic filters.

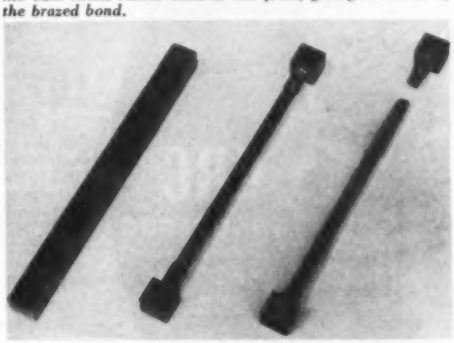
2. Metal powders are poured into a steel mold and subjected to high specific pressures without subsequent high temperature heating. This method is widely used in the manufacture of ferro magnetic cores.

3. Metal powders are compressed in a steel die and subsequently subjected to high temperature sintering treatment while protected by a special atmosphere. As long as the temperature is insufficient to cause fusion of the body, its shape will be retained. Subsequent re-pressing or coining in steel dies permits further densification and correction of dimensional variation, and additional heat treatments impart the required physical and structural characteristics to the body. This procedure is the one most universally employed and applies to functional parts, magnets or bearings.

4. Metal powders are subjected to simultaneous compacting pressure and heat at temperatures below the melting point of the powder mass. This method is generally called hot pressing or pressure sintering. It is used in the manufacture of many types of hard metal and diamond tools, and also in the production of steel-backed metal powder friction elements.

With certain modifications, the third procedure is also employed in the production of hard metal tool tips and electrical components. In the production of

6. *TENSILE TEST RESULTS with infiltration-brazed butted iron-copper bars. Rupture of specimen occurred in the base metal rather than at the joint, giving evidence of the brazed bond.*



EDITOR'S NOTE: Material on which this article is based is contained in an article by Dr. Goetzel in the British Publication, "Research."

CENTRALIZE

YOUR DEFENSE ORDERS

Central is strategically located and completely equipped with modern facilities to help you meet your critical defense production schedule.

Rely on Central to provide fast service on quality made die castings at lower cost.

- Complete engineering and design service.
- Wide range of quality aluminum and zinc alloys.
- Die and tool making facilities.
- Machining and finishing.

Take advantage of this centrally located source for complete and prompt service. Write today.

CENTRAL

DIE CASTING and MFG. CO.

2935 WEST 47TH STREET • CHICAGO 32, ILL.

For further information circle No. 20 on the Reader Service Card

BORG PROBLEMS:

To develop parts that would be strong, lightweight, and capable of being produced rapidly and economically in large quantities to close tolerances.

GRC* SOLUTIONS

Dial Hub and Adjusting Screw, engineered by GRC . . . *still* more GRC precision zinc die castings to help manufacturers solve their small parts problems.

BORG PRODUCT:

New, improved Bathroom Scale (800 series)

* TINY, PRECISION ZINC DIE CASTINGS

BORG-ERICKSON is just *one* of the hundreds of manufacturers who are successfully producing new designs and new products and enjoying new economies with GRC's revolutionary high-speed, mass production methods. Simple or intricate—GRC zinc die castings as small as .000004 of a lb. are turned out *automatically* . . . completely trimmed ready for use . . . from 100,000 pieces to many millions . . . *smallness unlimited* . . . at amazingly low cost to you.

Bulletin and samples available on request.

GRIES REPRODUCER CORP.

809 E. 133rd St., New York 54, Phone MOtt Haven 5-7400

MAX. WT. – ½ OZ.
MAX. LGTH. – 1¾"
SMALLNESS UNLIMITED

For further information circle No. 30 on the Reader Service Card

refractory metal products, the repressing operation is replaced by such metal working operations as swaging, forging, rolling and drawing.

These operations are diagrammatically shown in the flow chart of figure 1 which also indicates methods of powder production and preparation, as well as final treatments and methods of testing and control.

THE PROPERTIES OF POWDER METALLURGY PRODUCTS

A decisive factor in the selection of the powder metallurgy approach over competitive methods is the attainability of satisfactory properties of the product. Where the utilization of the method is the only one possible or practical to arrive at the desired product, as in lamp filaments, cemented carbide cutting tools, or certain bodies of controlled porosity, the properties of the powder product may be considered standard for lack of a scale of comparison.

It is perhaps no coincidence that the standards set by the powder product are in some cases quite high. The fine tungsten filament possesses the highest strength known in metals, viz. up to 650,000 psi, and cemented carbides possess the highest compressive strength and Young's moduli, viz. up to 900,000 psi and 100,000,000 psi, respectively.

Space limitations again prohibit a detailed accounting of additional physical and mechanical properties of the many different powder metallurgy compositions and products. The data established are truly enormous in volume and detail. But it proves interesting to treat the subject in a qualitative manner.

Next to the basic properties that are inherent in the specific metal or alloy under consideration, it is the effect of the powder and processing variables on the physical properties of metal powder compacts that is most significant. The latter is best presented in the form of trend charts, and some of the more generally established relationships are summarized diagramatically in figure 2.

One striking phenomenon apparent from this qualitative analysis is

the fact that the important physical properties are strictly dependent on the density, and that the relation is a linear function for many properties. Thus, the attainment of maximum density is an important axiom where products of high physical properties are desired.

THE ATTAINMENT OF MAXIMUM DENSITY

One of the chief criticisms that has been leveled at powder metallurgy is that high density of a part can not be attained in an economical manner.

There are several ways open to the powder metallurgist to achieve densities above the usual run, viz., from 65 per cent to 85 per cent of normal.

1. *High forming pressures.* With the softer powders densities, as sintered, above 90 per cent of theoretical can be achieved through the use of very high forming pressures, figure 3. High die and press costs and low die life make this procedure uneconomical.

2. *Precision sintering.* Through the use of carefully controlled sintering cycles a high density can be achieved, figures 4 and 5. Furnacing costs and incidental labor costs are excessive when this method is employed. Only those parts carrying premium prices can be made in this manner.

3. *Sintering in the presence of a liquid phase.* This process requires the presence of two or more metals in the compact, one of which must have a melting point materially below that of all of the other metallic components. Sintering is then carried out above the melting point of the one component and below the melting point of the others. When the one phase is transitory such as tin or zinc mixed with copper, it is absorbed in the solid phase, and there is a gradual rise in the sintering temperature. When the low melting phase is permanent, as cobalt in cemented carbides, a constant temperature sintering cycle can be used. In either case, there is a high degree of shrinkage of the compact during sintering.

This procedure is in general use for cemented carbides and similar products, but for the majority of the parts made by powder metallurgy the high degree of shrinkage precludes its use.

4. *Coining.* Coining to bring sintered parts to the desired dimensions is generally practiced throughout the industry. This operation is carried out at only enough pressure to achieve the desired sizing effect. Additional densification can be achieved by increasing the pressure above that required for sizing. Full density is seldom achieved by coining, but a density of about 90 per cent is possible. The process, including a re-sintering, is often employed in the production of ferrous and non-ferrous structural parts.

5. *Hot and Cold Working* — Hot and cold forging, swaging, rolling, and drawing is seldom employed except in the case of the refractory metals and some of the rarer metals.

6. *Hot Pressing* — By the simultaneous application of pressure and heat, compacts of maximum density

Aluminum and Zinc Base
DIE CASTINGS

PARAGON die castings are everything the name implies. Four offices are ready to serve you.

Our plant contains every modern facility to produce die castings which leave nothing to be desired in workmanship, accuracy, appearance and function.

Inquiries are invited. Send blueprints or sketches for quotation.

STRENGTH
PRECISION
UNIFORMITY
ECONOMY
COMPLEXITY

QUALITY PARAGON CAST DIE CASTINGS

PARAGON Die Casting Company
5853 WEST DICKENS AVE. • CHICAGO 39, ILL.
SALES OFFICES: DETROIT • INDIANAPOLIS • CHICAGO • MILWAUKEE

For further information circle No. 58 on the Reader Service Card

YOU'RE SURE OF QUALITY AND SERVICE

ZAMAK

ZINC BASE DIE CAST ALLOYS

Complete facilities plus modern production methods enables you to get high quality laboratory controlled zinc alloy which complies with ASTM and SAE specifications. Users of CERTIFIED receive prompt and dependable service for their requirements.

Certified Alloys Co.

BEDFORD, OHIO

For further information circle No. 22 on the Reader Service Card

ASK US FOR QUOTATIONS NOW!

FOR SMALL DIE CASTINGS

FORT RECOVERY Industries, INC.

Fort Recovery, Ohio

FOR DEFENSE CONTRACTS

You'll be *surprised* at our efficiency and economy in fast production of zinc die castings up to ½ lb. We are equipped to machine them to your special requirements . . . and can make *exceptionally low cost* dies!

Quotations can also be furnished for aluminum die castings and brass or bronze sand castings.

WRITE TODAY, sending your samples or blueprints, for our quotations!

FORT RECOVERY INDUSTRIES, INC.
Fort Recovery, Ohio

For further information circle No. 28 on the Reader Service Card

(100 per cent) can be secured without the presence of a liquid phase. Other than special cases such as cemented carbides, this process is not widely used.

7. *Infiltration* — A modification of the use of a liquid phase which involves the use of a liquid phase to fill the pores of a compact without mixing the metal to be melted into the original powder composite is becoming more widely used. The widespread use of this technique has made possible the manufacture of certain parts that had previously been considered impossible to make.

PRINCIPLES OF THE INFILTRATION MECHANISM

Essentially the infiltration process involves the filling of the pores of a "skeleton" with a low melting point metal to secure a high density part. This procedure eliminates the need for high forming pressures, extensive furnacing cycles, coining, hot pressing, or liquid impregnation as previously defined. Generally, low forming pressures are used, thus giving economical pressing operations and for any given press capacity often increasing the size of the piece that can be pressed.

The process can sometimes be applied whenever a multi-component compact can be tolerated.

Lately the mechanism of metal impregnation has been given considerable attention (1-3). For successful infiltration certain factors must be attended. A substantial difference in the melting points of the skeleton and infiltration components must exist. The two components must be mutually insoluble in each other. The infiltration time and temperature must be maintained as short and as low as possible. There should be no alloy formation or formation of any intermediate phases during the infiltration. A suitable furnace atmosphere to avoid oxidation or contamination of either the skeleton or the infiltrant should be used.

VARIATIONS IN TECHNIQUE

Of the numerous methods developed for carrying out the actual infiltration the three most important, figure 3, are:

1. Capillary dip-infiltration —

infiltration by immersion of a small section of the skeleton body in the liquid bath.

2. Full dip infiltration — complete immersion of the skeleton body in the liquid bath.
3. Contact-infiltration — Infiltration by penetration of the molten metal initially in juxtaposition with the skeleton as a solid metal.

To these three major methods several modifications can be added. These are: Gravity feed of the infiltrant from a reservoir, pressure impregnation by a gas or liquid pressure on the liquid, centrifugal pressure impregnation, and vacuum impregnation.

Many of the factors that effect the selection of a powder for use in the more usual methods of powder metallurgy apply to the selection of a powder for the skeleton. This same applies to the molding procedures, furnacing procedures, etc.

PROPERTIES AND APPLICATIONS

Generally speaking, composite infiltrated bodies distinguish themselves from their sintered counterparts in several noteworthy points.

1. As previously mentioned, fully

7. Offset spur gear assembly from cemented steel. The two gears were individually molded and clamped together in a fixture before being sintered and radially infiltrated with copper alloy. During infiltration, gears were brazed into one unit. Such a gear unit cannot be produced by conventional powder metallurgy processes, since the offset teeth prevent ejection from the mold.

or near fully dense bodies are obtainable with comparative ease, provided we deal with multiple component

YOU'RE SURE OF QUALITY AND SERVICE

ALUMINUM DIE CASTING ALLOYS

Aluminum alloys produced under quality controlled methods are specially designed to meet your die cast permanent mold or sand casting requirements.

For prompt dependable deliveries of quality aluminum in any quantity, write to

ALUMINUM SMELTING & REFINING CO., INC.

BEDFORD, OHIO

For further information circle No. 10 on the Reader Service Card

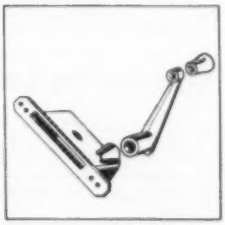
ONE MANS MEAT...

TOUGH DIE CASTING JOBS ARE OUR MEAT...

We like to figure on tough die casting jobs. *Fort Die Casting* engineers have cracked many a tough nut and we are ready and willing to take on your problem.

In addition to a competent engineering staff who can adapt your designs to take full advantage of the speed, economy and quality of the die casting process, we have fully equipped tool and die rooms to convert these ideas into reality.

Call on us today.

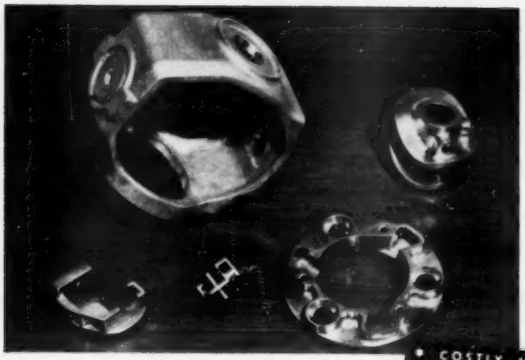


"Certified Analysis Alloys"

FORT DIE CASTING CORP

MARYSVILLE, MICHIGAN

For further information circle No. 27 on the Reader Service Card



Scale — ½" = 1⅛ App.

• COSTLY MACHINING OPERATIONS WERE COMPLETELY ELIMINATED BY CASTING THESE PARTS BY THE "LOST WAX PROCESS."

Machined? or Cast?

PRECISION INVESTMENT CASTING

- cast centrifugally
- non-ferrous only
- models and molds made by us
- sample delivery three weeks from receipt of order

Send blueprints or samples today for prompt quotations.

Z & H MFG. CORP.

31 Welcher Avenue • Peekskill, New York

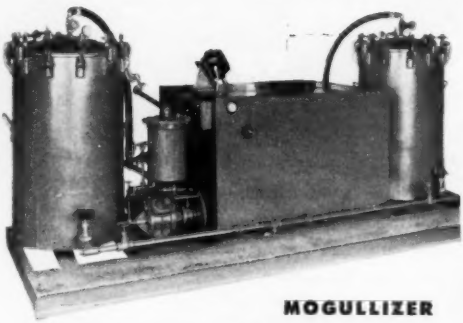
For further information circle No. 80 on the Reader Service Card

systems and are allowed products having a duplex structure.

2. Coinciding with the high density, internal notch effects and stress raisers are greatly diminished, and tensile strength, yield point and, in particular, elongation, reduction of area and impact strength are greatly improved. In fact, it has been found that even in incompletely infiltrated skeletons, strength and ductility values are considerably increased over those of merely sintered bodies of like composition, provided melting conditions are good and the infiltrant covers the walls of the pores and channels, thereby filling in crevices and sharp notches.

3. Additional improvement in strength and toughness is obtained where the skeleton-infiltrant combination results in alloying and permits quench hardening or precipitation treatments.

4. Chemical behavior of the skeleton material may be influenced by alloying or simply encasing the particles with an infiltrant possessing



MOGULLIZER

Eliminates Leaky Castings

If your contract calls for impregnation, or if your production castings leak or weep and will not hold pressure, investigate our Mogullizing system—a high vacuum and pressure method of sealing castings. Models to meet your requirements.

Any standard impregnating material can be used but for top efficiency we recommend our Mogul Cast Seal.

Prompt deliveries.

Write today for full details on the Mogullizing system.

METALLIZING COMPANY OF AMERICA

3520 W. Carroll Avenue • Chicago 24, Ill.

For further information circle No. 45 on the Reader Service Card

YODER DIE CASTING

offers you this

PRODUCTION COUNSELING SERVICE!

AT no obligation to you, Yoder's staff of experienced engineers will gladly give counsel to your production problems. You'll discover many instances where die casting can save you production costs. Call, wire, or write today!

Centrally located to industrial producers

Yoder

DIE CASTING, INC.

728 Kiser Street • Dayton 4, Ohio

For further information circle No. 79 on the Reader Service Card

different chemical properties. A corrosion or heat resistant alloy infiltrant may substantially or completely protect a corrosion or heat susceptible skeleton body.

5. The filling of the pores with a metal or alloy suitable for electroplating, brazing or welding makes possible this type of treatment for the composite even though the skeleton material alone may not be suitable for the purpose.

APPLICATIONS OF INFILTRATION METALLURGY

Heavy Duty Contact Materials and Welding Electrodes. Refractory metal contacts and electrodes which are permeated by a conductor metal constitute the classical example of infiltration technology. The pure refractory metals, tungsten, and molybdenum, excel by their wear resistance and stability in the electric arc during sparking, but they lack satisfactory electrical and heat conductivity.

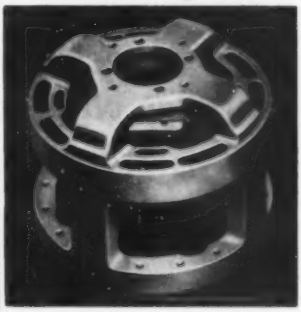
The metals copper and silver, on the other hand, show poor resistance to abrasion and material transfer during opening and closing of switch gear contacts, but conduct heat away from the arcing surface and are readily brazed to supports.

A mechanical combination of both types of materials, each in a well dispersed pattern, gives an optimum array of the desirable properties in the contact. This combination is ideally accomplished by infiltration, as molten silver and copper display excellent wetting properties on tungsten or molybdenum, whereas no appreciable solubility between the components exists.

The effect of composition on density and hardness of tungsten-copper alloys made from different powders is shown and a comparison between infiltrated and sintered and worked material is given in figures 4 and 5.

Structural Cupric Steel Components. It is common knowledge that iron and steel products made by orthodox powder metallurgy techniques possess inferior physical properties as compared with wrought metal. While tensile and related properties approach those of the fusion counterpart, elongation, and, in par-

The Most Complete and Modern Die-Casting Facilities in New England



Our latest type high pressure Lester Phoenix machines insure precision low-cost castings.

You can depend upon our proven know-how to design and develop your most intricate castings.

Ask to have the Mason representative call, or send us your prints. Our Engineering department will give every request, whether large or small, conscientious prompt attention.

L. E. Mason is an approved source for America's leading manufacturers.

L. E. MASON CO.
BOSTON 36, MASS.
Established 1931

Circle No. 44 on the Reader Service Card

SERVING THE MIDWEST
with Quality
ALUMINUM & ZINC Die Castings

Our fully-equipped plant is now serving some of the nation's largest manufacturers from the Great Lakes to the Gulf

Trimming • Machining
Die Making • Die Casting
Plating • Assembling

WRITE FOR CATALOG

TRI-STATE DIE CASTING CORP.
HENDERSON, KENTUCKY
Chicago: 176 W. Adams St. • New York: 12 E. 41st St.
Los Angeles: 10583 Heiman • Detroit: J. Simmons, 4697 Lakewood
Affiliate of Tri-State Plastic Molding Co., Inc.

For further information circle No. 76 on the Reader Service Card

RACINE

ZINC OR ALUMINUM die castings of highest quality produced on modern, fast equipment. Guaranteed satisfaction. Prompt service.

Inquiries Invited

Tell us your needs. Send blueprints or drawings for quotation. No obligation, of course.

RACINE DIE CASTING CO.

1500 16TH ST., RACINE, WIS.

Circle No. 64 on the Reader Service Card

DIE CASTINGS

C. M. GREY MFG. CO.

ALUMINUM OR ZINC

☆

QUALITY PRODUCTS SINCE 1910

SEND BLUEPRINTS OR SAMPLES FOR QUOTATIONS

358 CENTRAL AVENUE
EAST ORANGE, N. J.

Circle No. 29 on the Reader Service Card

ticular, reduction of area values, fall far short of normal, as do values for impact strength.

In surface-hardened or through-hardened structures, the hardness also is generally below standard. As earlier indicated, the inherent porosity is primarily responsible for these shortcomings. However, the excellent wetting and conveniently limited solubility conditions existing between iron and copper have opened an entirely new approach to the problem, and most interesting possibilities are envisaged in copper-infiltrated sintered iron and steels.

Aided by precipitation and quench hardening, quite unusual sets of physical and chemical properties have been established for this class of materials. In addition to these improvements in physical properties, the many other advantages that the infiltration of ferrous sponge bodies with copper or copper alloys offer must be considered.

The most important of these are the self-brazing capacity of the cupric

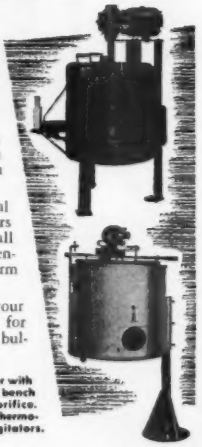
SPEED UP WAX MELTING
with STA-WARM HEATING TANKS

● Name your wax melting requirement! Sta-Warm will suggest *exactly* the tank or pot in their wide and varied line to produce the heated wax you need at the rate you need it.

Or, their engineers will analyze your special problem and design the unit to do your job as you want it done.

Heating and dispensing unusual compounds and tailoring melters to unusual production set-ups is all in the day's work for Sta-Warm engineers. Put specialized Sta-Warm "know-how" to work for you.

The *right* equipment can break your wax melting bottleneck. Write for Sta-Warm recommendations or bulletins today.



Shown at right (above) is 25 gal. melter with molasses gate valve. Below it is 5 gal. bench type dispenser with needle valve orifice. Both models equipped with variable thermostat controls and power driven agitators.

Sta-Warm ELECTRIC CO.

525 N. CHESTNUT ST. • RAVENNA, OHIO

For further information circle No. 69 on the Reader Service Card

MODERN
Precision Investment
CASTING

This is the modern tool for the manufacture of small intricate parts . . . vital for quick production on defense orders and essential for functional design.

For complete equipment, all operating supplies, and advice on applying this process, call on us.

Send for our booklet, "Modern Precision Investment Casting."

ALEXANDER SAUNDERS & CO.

Precision Casting Equipment & Supplies

93 Bedford St., WAtkins 4-8880 New York 14, N.Y.

For further information circle No. 66 on the Reader Service Card

phase and the facility for electroplating without adverse surface corrosion.

In order to appreciate the full impact which this development has had in the powder metallurgy of iron and steel of recent years, we may cite just one example, jet engine compressor blades, which today are produced by this method on a very large scale. (4-6) These blades have a yield strength of 90,000 psi combined with an elongation of 5 per cent and are able to withstand three to four times as much vibration as 13 per cent chromium steel and eight times as much as carbon steel blades.

The self-brazing capacity of the copper-infiltrated steel is demonstrated in figure 6 showing the tensile break of infiltration-brazed butt-joined test bar sections away from the joint.

Figure 7 shows a unique offset spur gear combination wherein the two gears were individually molded and infiltration-brazed into one unit. It might be well to note before leaving the subject that steady research during the past several years has

Parts with intricate contours in quantities from 500 to 5 million!

Complicated parts . . intricate shapes . . precision ferrous and non-ferrous castings . . are made to EXACT specifications by the CHEMICAST investment casting process.
High standards of accuracy and finish are always assured. Moreover, the chemicast process is very economical and orders are completed rapidly.
Should you have parts problems in the development of new products—our engineering department is at your service. Send us a print, together with specifications and pertinent data . . recommendations will be made with no obligation whatsoever on your part.

PRECISION CHEMICAST CASTINGS

CHEMICAST DIVISION
WHIP-MIX CORPORATION
411 WEST AVERY AVE. • LOUISVILLE 8, KENTUCKY

For further information circle No. 103 on the Reader Service Card

PERMANENT MOLD CASTINGS
by Moldcast

Specialists & Leaders in the Field of Permanent Mold Aluminum Casting

•

One of the Largest Organizations in the East Devoted Exclusively to Permanent Mold Casting

•

Unparalleled Quality
Excellent Delivery

MOLDCAST PRODUCTS, INC.
Pacific St., South — Newark 5, N. J.

For further information circle No. 51 on the Reader Service Card

11 MILLING OPERATIONS ELIMINATED BECAUSE IT'S

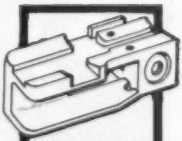
JELRUS INVESTMENT CAST IN ONE PIECE

A saving of over 52%

There are probably many parts in your production picture that can be Jelrus precision investment cast to afford you the same big savings in tooling costs, set-up and machine time, scrap loss, and assembly time.

Often many parts of intricate contour can be combined into a single precision cast unit in any castable alloy. Let our engineers show you how to save precious time, money, machining and handling.

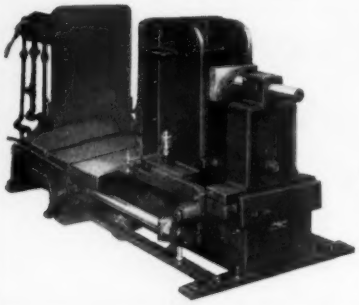
Send sample parts or prints.



MOUNTING BASE
Formerly made of 3 parts assembled together now Jelrus precision investment cast in one piece.

JELRUS
PRECISION CASTING CORP.
136 West 52nd Street New York 19, N. Y.
Investment Casting

For further information circle No. 37 on the Reader Service Card



PERMANENT MOLD MACHINES

for

Hand, Air or Hydraulic Operation

Built to suit your requirements
Send complete specifications so we can quote prices and deliveries.

STANDARD MACHINERY CO.
Grand Rapids 4, Michigan

For further information circle No. 68 on the Reader Service Card

For Faster, More Accurate Lost Wax Casting

- Safest machine of it's type
- Works with rubber or metal molds
- Fingertip thermostatic control
- Produces accurate waxes with single or multiple cavity molds
- Non-pourous castings as a result of clean waxes.

Here is the finest, most efficient, and economical machine of it's kind ever designed. Beautifully streamlined, precision balanced, and unconditionally guaranteed. Latest model Finelt Universal Wax Injector, Complete with thermometer.

See your dealer or inquire direct

ac-dc
110-220
volts

AROFINE PRODUCTS COMPANY
42 WEST 48TH STREET, NEW YORK 19, N. Y.

For further information circle No. 14 on the Reader Service Card

expanded the original iron-copper combination to include manganese and chromium alloy steels, as well as stainless steels, as skeleton material.

Brasses, bronzes, cupronickel and manganese-copper are used as infiltrant alloys. In fact, for extreme corrosion resistance, an all-stainless material has also been successfully developed wherein the cupric phase is replaced by silver, and the skeleton consists of 18-8 stainless steel.

Refractory Metal Base Superalloys. Finally, a few words should be devoted to the latest and perhaps most interesting, if not most significant development in infiltration metallurgy, namely, the combination of nickel- or cobalt-base heat resistant alloys with tungsten and other refractory metals, or with their carbides and other compounds. Recently, considerable research in this field has been invited by the urgent requirements for a heat resistant strong and nonbrittle material for jet engine and gas turbine components operating at or above 1800 degrees Fahrenheit.

NEW BOOKLET!

PRECISION "INVESTMENT CASTING"

...its uses and applications

For design engineers and production executives

Here is a 12 page definitive treatment in words and pictures of the precision INVESTMENT CASTING process.

For close tolerance parts in difficult-to-machine metals, and with intricate contours... INVESTMENT CASTING is the fastest... the least expensive... one of the most accurate methods of production.

Write for your free copy on your business letterhead.

INVESTMENT CASTING CO.
319 CHESTNUT ST. NEWARK 5, N. J.
PRECISION CASTINGS

For further information circle No. 36 on the Reader Service Card

PREcision casting inVESTments
By PRE-VEST, Inc.

Specialists in the development and manufacture of industrial investments for ferrous and non-ferrous precision casting.

Research Laboratory

Here are five of the many reasons why PV-Investments lead in the industrial field.

1. **FAST DEPENDABLE SERVICE**
   Production facilities in our new, modern plant assures you of quick service.
2. **PRODUCTION PROVED PROPERTIES**
   Tons of our industrial investments are used daily by leading precision casters.
3. **QUALITY CONTROL**
   All our investments are carefully tested to assure you of uniform results drum after drum.
4. **ENGINEERING SERVICE**
   Pre-Vest engineers have over 10 years experience in the manufacture and use of industrial casting investments. The Pre-Vest laboratory is fully equipped to assist you in solving your investment problems.
5. **PRICED RIGHT**

WRITE, WIRE, OR PHONE FOR ADDITIONAL INFORMATION, OR CHECK NO. 63 ON READERS SERVICE CARD.

PRE-VEST, Inc.
23420 Lakeland Blvd. REdwood 1-6800 Cleveland 17, Ohio

Encouraged by the experience with the infiltration of tungsten with copper in contact metal production, and with copper-nickel in the manufacture of "Heavy Metal", the introduction of nickel alloys of the Nichrome type was only one additional step. (7)

Indeed, most interesting combinations of high temperature strength and oxidation resistance properties were ob-

served in some combinations, especially where alloys of tungsten with chromium in percentages from 15 to 35 per cent were used as skeleton bodies. (7)

Of even greater significance are the properties that can be obtained when the tungsten is replaced by the much lighter and stronger titanium carbide as skeleton material.

REFERENCES

1. R. Kieffer and F. Benesovsky, Berg-und Huettenmaennische Monatshefte, 94, No. 8/9, 284 (1949)
2. R. Kieffer and F. Koelbl, Berg-und Huettenmaennische Monatschefte, 95, No. 3, 49 (1950)
3. P. Schwarzkopf, Metal Progress, 57, No. 1, 64 (1950)
4. G. Stern and J. A. Gerzina, Iron Age, 165, No. 8, 74 (1950)
5. Anonymous, Product Engineering, 22, No. 5, 123 (1951)
6. Anonymous, Business Week, Jan. 6, 1951, p. 45
7. C. G. Goetzel, Powder Metallurgy Bulletin, 6, No. 1, 35, (1951)

BETTER BALANCED PARTS
continued from page 37

quite close in some cases, + .005. This approaches the finest production tolerances by investment casting.

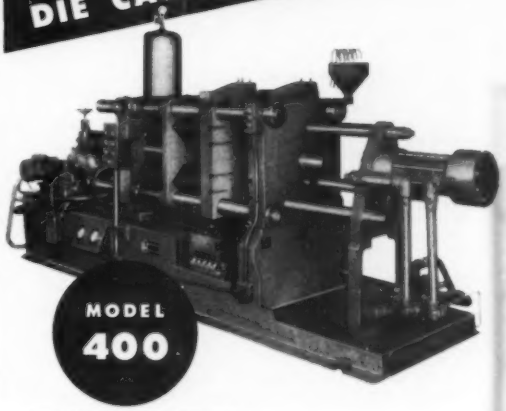
An unusual specification on this part is the weight tolerance of 9 grams +0,-1 grams. The necessity of this weight specification is obvious, bnt it is not often that the investment caster is faced with the necessity of meeting more than a dimensional tolerance.

The piece formerly used was a drop forging and a considerable amount of difficulty was experienced in securing parts that met the weight tolerances without making an oversize forging and grinding to weight.

As with the stop finger described above, the change from a drop forging to an investment casting reduced the number of machining operations. The investment casting need only have two holes drilled and two surfaces polished.

B & T

COLD CHAMBER DIE CASTING MACHINES



LET US ARRANGE TO DEMONSTRATE THESE MACHINES WHILE YOU ARE IN DETROIT

FUNCTIONAL FEATURES

- 4 Heavy Toggles locking directly under the bars
- Simplicity and accessibility with all hydraulic valves panel mounted which assures ease of maintenance
- A 2,000 PSI hydraulic system with nitrogen loaded accumulator and all welded joints with flange mountings
- Locking pressure of 450 tons
- Platens 30" x 30" x 5" with 4" heat treated tie bars on 24" centers
- Operated by 20 HP motor

We also build 2 other sizes of cold chamber machines and four sizes of zinc machines.

B & T ENGINEERING AND SALES CO.

112 MADISON AVE. • DETROIT 26, MICH. • WO. 5-3140

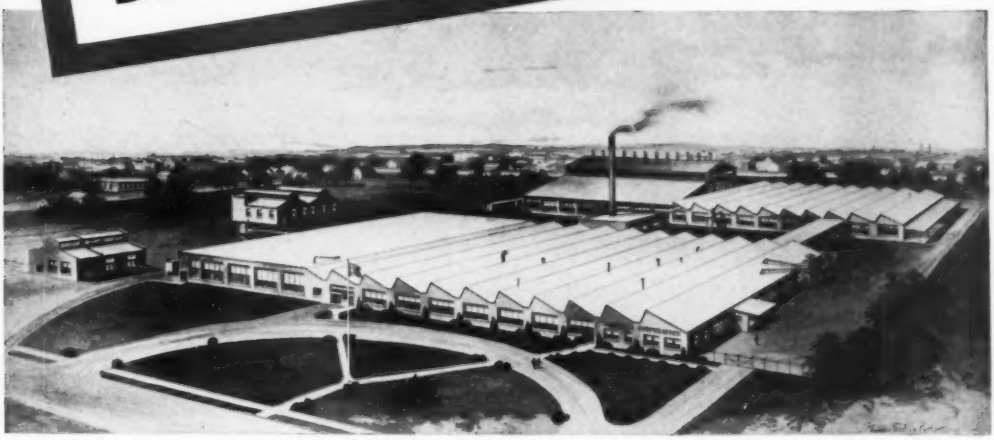
INDEX OF ADVERTISERS AND THEIR AGENCIES IN THE OCTOBER ISSUE OF PRECISION METAL MOLDING

ADVERTISER	AGENCY	Page No.
A.B.C. Die Casting Machine Co.		89
Abbott Ball Co.	R. H. Young & Associates	68
Accurate Die Casting Co.		79
Acme Aluminum Foundry Co.		20
Acromark Co.	Advant Associates, Inc.	62
Admiral Die Casting Corp.	The Advertising Corp.	76
Advance Pressure Castings, Inc.	Asher, Godfrey & Franklin, Inc.	15
Advance Tool & Die Castings Co.		88
Allied Research Products, Inc.	Emery Advertising Corp.	58
Almco Div., Queen Stove Works, Inc.	Weston-Barnett, Inc.	56
Aluminum Company of America	Fuller & Smith & Ross, Inc.	26, 27
Aluminum Industries, Inc.	Keelor & Stites Co.	3
Aluminum Smelting & Refining Co.		97
American Die Casting Institute, Inc.		18
American Society for Metals	Fuller & Smith & Ross, Inc.	22
American Zinc Sales Co.	John Stover Advertising Agency	16
Applied Research Laboratories	Willard C. Gregory & Co.	25
Armour & Co.	Foote, Cone & Belding	64
Arofine Products Co.	Durand Advertising	102
Arwood Precision Casting Corp.	J. C. Dillon Co.	86
Atlantic Casting & Engineering Corp.	Wehner Advertising Service	46
B & T Engineering & Sales Co.	Hopcraft-Keller, Inc.	103
Badger Die Casting Corp.	Van Handel Advertising Agency	53
Behr-Manning Corp.	Peterson & Kempner, Inc.	61
Bellows Co.	Ralph Gross Advertising, Inc.	66
Casting Engineers, Inc.	Roy D. Zeff & Associates	54
Central Die Casting & Mfg. Co., Inc.		94
Certified Alloys Co.		96
Christiansen Corp.	Arthur R. Mogge, Inc.	Cover 4
Cleveland Hardware & Forging Co.	Kohorn Advertising Service	80
Conforming Matrix Corp.	Wendt Advertising Agency	67
Cowles Chemical Co.	Bayless-Kerr Co.	63
Daniels Plating Barrell & Supply Co.	Asher, Godfrey & Franklin, Inc.	74
Diversey Corp.	Cruttenden & Eger, Advertising	75
Dollin Corp.	Thoma & Gill	5
Dumore Co.	Andrews Agency, Inc.	68
Enley Products, Inc.	Dickerman Advertising Agency	62
Federal Die Casting Co.		88
Fort Die Casting Corp.	Creative Services, Inc.	97
Fort Recovery Industries, Inc.	Bob Robinson, Inc.	96
C. M. Gray Mfg. Co.		100
Gries Reproducer Corp.	Harold Marshall Advertising Co.	94
Groov-Pin Corp.	Thoma & Gill	62
Henning Bros. & Smith, Inc.		90
Hilfinger Corp		Cover 3
Hoover Co.	Leo Burnett Co., Inc.	32
Hydraulic Press Mfg. Co.	Jay H. Maish Co.	28
International Powder Metallurgy Co.		89
Investment Casting Co.	United Advertising Agency	102
Jelrus Co., Inc.	United Advertising Agency	101
Kiowa Corp.	Kane Advertising Agency	11
Kux Machine Co.	Kuttner & Kuttner, Inc.	1
Lindberg Engineering Co.	Shrout Associates	6
Litemetal Dicast, Inc.	L. J. DuMahaut Advertising Agency	87
Maas & Waldstein Co.	Franklin Fader Co.	78
Madison-Kipp Corp.	The Buchen Co.	7
Marvel Engineering Co.	Guenther-Bradford & Co.	47
L. E. Mason Co.	Allied Advertising Agency	99
Mead Specialties Co.	L. W. Ramsey Co.	74
Metallizing Company of America	Frank C. Nahser, Inc.	98
Metals Disintegrating Co.	Mercready, Handy & Van Denburgh	78
George L. Miehl Co.		101
Miller-Taylor Tool Co.	Gerst, Sylvester & Walsh	24
C. H. Millies Foundry Co.		19
Milwaukee Die Casting Co.	Paulson-Gerlach & Associates, Inc.	10
Moldcast Products, Inc.		101
Monarch Aluminum Mfg. Co.	Lang, Fisher & Stashower, Inc.	Cover 2
Monsanto Chemical Co.	Gardner Advertising Co.	30
Mt. Vernon Die Casting Corp.	Lewin, Williams & Saylor, Inc.	9
National Precision Casting Corp.		84
Neilson Chemical Co.	Dudgeon, Taylor & Bruske, Inc.	67
New England Die Casting Co.		13
Newton-New Haven Co.		4
New Holland Machine Co.	J. Walter Thompson Co.	59
Niagara Alkali Co.	Hazard Advertising Co.	73
Oakite Products, Inc.	Rickard & Co., Inc.	68
Paragon Die Casting Co.		95
Parker White-Metal Co.	Davies & McKinney	17
Precision Castings Co., Inc.	Flack Advertising Agency, Inc.	31
Pressure Cast Products, Inc.		29
Pressure Castings, Inc.	Humphrey, Prentke & Associates	23
Pre-Vest, Inc.	Murray Young, Advertising	102
Racine Die Casting Co.		100
Radio Cores, Inc.		83
St. Joseph Lead Co.	Walter Taegen Associates	14
Alexander Saunders & Co.	Charles Mackenzie, Advertising	100
Schultz Die Casting Co.		21
G. W. Smith & Sons, Inc.	Odiorne Industrial Advertising	8
Standard Machinery Co.		102
Sta-Warm Electric Co.	E. T. Geddes Advertising Service	100
Frederic B. Stevens, Inc.	Grant Advertising, Inc.	71
Stewart Die Casting Div., Stewart-Warner Corp.	MacFarland, Aveyard & Co.	90
Stroh Die Moulded Casting Co.		90
Superior Die Casting Co.	W. B. Doner & Co.	12
Thompson Products, Inc.	Griswold-Eshleman Co.	51
Tool-Die Engineering Co.	C. A. Reece Industrial Publicity	77
Tri-State Die Casting Corp.	Lewin, Williams & Saylor, Inc.	99
United Chromium, Inc.	Rickard & Co., Inc.	69
Universal Die Casting Co.		84
Van Dorn Iron Works Co.	Bayless-Kerr Co.	85
Whipmix Corp.	W. C. Hellman, Advertising	101
Yoder Die Castings, Inc.	Weber, Geiger & Kalat, Inc.	98
Z & H Mfg. Co.		98

HILFINGER

With 115,000 Square Feet of Manufacturing Space

Does the *Complete* Job



DESIGN
DIE CASTING
PLATING
ASSEMBLY
AND
PACKAGING
ALL UNDER ONE ROOF

IF YOU ARE LOOKING for a thoroughly dependable source of supply for every phase of your die casting requirements we believe that our extensive facilities for doing a complete job merit careful consideration.

Here at Hilfinger we have the skilled organization (450 employees) and the modern equipment to do everything from design to packaging under one roof.

Since this company was established in 1916 we have served a wide variety of manufacturers and today are in an excellent position to again supply your government or defense needs. All inquiries will receive the most prompt attention and our engineers are ready to serve you.

HILFINGER CORPORATION

1830 Westwood Avenue • Toledo 7, Ohio

JOrdan 3706

SALES OFFICES: New York City, Chicago, Detroit

For further information circle No. 32 on the Reader Service Card.

An invitation to companies casting in ALUMINUM . . .

Through its various integrated company operations *, Christiansen Corporation is in a unique position to help solve customer problems.

Foundrymen and die casters for many years have relied on the dependability of EDCO aluminum alloy ingots as their standard of quality. Nationally recognized Christiansen metallurgists combine their valuable knowledge with modern laboratory facilities to maintain and control the quality of every EDCO ingot produced.

The Christiansen Laboratories provide expert consultation and complete light metals testing at nominal cost. Write for "Quality Increases Sales" to obtain complete information and price schedule.

EDCO CHRISTIANSEN CORPORATION

the name EDCO assures quality control

CHRISTIANSEN CORPORATION

1918 NORTH KILPATRICK AVE. . CHICAGO 51, ILLINOIS

Aluminum Alloy Ingots . . . Zinc Base Die Casting Alloys . . . Edco Dowmetal Bottom Boards

PLANTS IN: Chicago, Ill., East Chicago, Ind., Chicago Heights, Ill.

For further information circle No. 23 on the Reader Service Card